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Journal of the Society of Arts.

FRIDAY, APRIL 27, 1855.

NINETEENTH ORDINARY MEETING.

WEDNESDAY, APRIL 25, 1855.

The Nineteenth Ordinary Meeting of the One Hundred and First Session, was held on Wednesday, the 25th inst., Robert Lowe, Esq., M.P., in the Chair.

The following Candidates were balloted for and duly elected :—

Alexander, Caledon
Allison, George
Almgill, Thomas
Chevallier, George Smart
Gordon, J. W.

Norton, John
Powell, Francis
Pritchard, John, M.P.
Simmonds, Peter Lund

The paper read was

ON PUBLIC WORKS FOR INDIA, ESPECIALLY WITH REFERENCE TO IRRIGATION AND COMMUNICATIONS.

By COL. ARTHUR COTTON, LATE CHIEF ENGINEER, MADRAS.

This is a vast subject. It seems impossible to compress even the leading points of it into the compass of a short paper; you will bear with me, therefore, if I come at once to the point.

The first thing, then, seems to be the state of India in respect of public works. Besides innumerable minor works, which are required in every country, fully to develop the material and even moral welfare of a people, in whatever climate, and which cannot be even touched upon here, there are, first of all, in a tropical climate, or even in an extra-tropical one, which has a rainy season that is sometimes very scanty, works of irrigation.

Secondly. In all climates, communications.

Thirdly. Harbours.

It seems most obvious that the fundamental principle in political economy is to secure, as far as possible, an abundant supply of food, with only such an expenditure of human labour as shall leave a large surplus of the time of the community for all those things which constitute the difference between the mere animal and the intelligent being. Until a large portion of the community are set free from labouring to produce food, there can be no cultivation of the mind, even if, with the labour of all, a supply of food is secured; but if to this degree of difficulty of obtaining food there is added, from occasional failure of periodical rains, famine, the misery and evil, both physical and moral, is indescribable. Now, in a tropical climate at least, the management of the water is, according to my 30 years' experience in India, undoubtedly, and beyond all comparison, the most important thing to be attended to, in order to provide for these two things, a supply of food that shall be, first, as certain as possible, and, secondly, obtained with only a moderate degree of labour. I think this is clearly shown by this very simple fact. In India, water is raised from wells and rivers in every district from the Himalayas to Cape Comorin, by means of bullocks and men, for the purpose of irrigation, at an average of about 6,000 cubic yards for a pound sterling. This is an unmistakeable proof that it is worth, at least, so much, otherwise it would not continue to be raised by millions of cubic yards, year after year, at that cost; and then, further, water can be provided by means of works on a large scale, and applied to the land at the rate of 100,000 to 300,000 cubic yards for a pound. This

is proved by the actual cost of large works executed by our government.

I will only here give one instance of the provision of water on a large scale. The system of works for the irrigation of the Delta of the Godavery, 400 miles north of Madras, consisting of a weir, or anicut, as we call it, across that river, with the channels and various works of masonry required for distributing and regulating the water throughout the Delta, will cost about £300,000. The works are now approaching completion, and they are, to a great extent, in operation. The water will be distributed over 1,200,000 acres, and allowing 4 per cent. interest on the outlay, and an equal sum for management and repairs, the actual cost of the water will be about 30,000 cubic yards for a pound. This, however, also includes the making the channels navigable, so that the whole Delta will be pervaded by a system of water communication, all the large ones being fit for steam navigation. This is certainly one of the most favourable situations for such irrigation, but if we take even 200,000 cubic yards of water for a pound, the cost is not one-thirtieth of the proved value of water for irrigation. There can be little hope that any means of cheapening food can be found to surpass this. It is just as if a man in this country found a kind of manure that would cost a pound an acre, and increase the produce by 70 bushels of wheat, worth £30. Another proof of the effect of water is given by the government return of all the new irrigation works in the Madras Presidency for 13 years, which showed an average result of 70 per cent. on the outlay, in government revenue, so that, including the profit to the landowners, it could not have been less than 200 per cent. in all, or fifty times the interest of money.

But besides this effect of water in diminishing the labour required for raising food, there is an absolute necessity for such works, to prevent actual famine. Almost every part of India is occasionally visited by famine, from the failure of the Monsoon rains, and there are few parts in which hundreds of thousands have not died of it under our rule. Only last year, in one district, the government had to provide 100,000 people with employment for several months, while they fed them to prevent them starving.

Secondly, with respect to communications, I need not say much on the value and necessity of them, as they are equally required in all climates, though the importance of them in a vast continental country, where the distances are very great, is incomparably greater than in a small country, like England, with its natural very cheap water transit round its coast, within a comparatively few miles of every part of the country. With respect to the movement of goods, the fundamental principle seems to be that *everything is worth more in some other place than where it is*, and consequently that an increased value can be given to it by moving it, if it can be transferred sufficiently cheap; and things which are utterly valueless where they are found, will be of some value in other places, and hence that an increased value can be given to the product of a country, by a system of cheap transit, to an extent which cannot be calculated, but as whatever the transit costs is so much deducted from the net profit of transit, the object to be aimed at is the *annihilation of the cost of carriage*. This should never be lost sight of. The question is not "Is such a mode of transit cheaper than such another?" but, "Is it the cheapest that can be devised for such a line of communication?" When first tram-roads were invented they used wheels of very small dimensions, because, they said, the draught was so easy that large ones were unnecessary; but in time they have found out that there was no sense in throwing away the further advantage to be obtained by large wheels. However, that mode of reasoning is constantly applied to this day in arguing about communications; and there will be a hard battle fought before England is provided with a system of steam boat canals, in which the goods can be conveyed at one-eighth of a penny a ton a mile; instead of the present

modes of conveyance by railway at 1d., and by small canals at 1d., exclusive of tolls, and by the coast at $\frac{1}{3}$ to $\frac{1}{4}$ of a penny.

And, with respect to the conveyance of passengers, the principle seems to be, that in proportion as time and cost are diminished, is the power of communications increased in innumerable ways, many of them far beyond our perception. But time is a far more important element in the question of passenger transit than in that of goods; yet it is far less so than is generally supposed, as is proved by this, that in the summer by far the greater part of the first-class passengers travel by sea in 50 hours from London to Edinburgh, with all the risks and inconveniences of a sea voyage, in preference to going by land in twelve, the cost of the sea transit being 14s., and that of the railway from 60s. to 80s., from which it is evident that, even in the wealthiest country in the world, almost the whole of the travellers would prefer going at 10 miles an hour at a certain cost, than pay five times as much to go at 40 miles: and hence we conclude safely that in a poor country like India cheapness is the grand desideratum both for goods and passengers, and that high speed is comparatively quite insignificant.

The third essential in the way of public works seems to be harbours. No country in the world can supply itself with all that is required for a highly-civilised state of society, and consequently to provide for the cheap shipping and landing of goods is essential to the welfare of every country; but especially in this case, where a country like India can at once obtain all the benefits of the manufacturing skill and capital of a country far more advanced than herself by sending her own raw produce to purchase it.

The cheapness of sea transit depends in a great measure upon the safety of the shipping at the ports, and the facility of landing goods; and as the whole world is here brought into competition, upon this cost of shipment must depend whether a country's produce is saleable at all, or not, and in proportion as that which a country has to sell is bulky is the importance of cheap ports to her.

It is not for the sake of her few hundred tons of indigo, but for her hundreds of thousands of tons of rice, oil seeds, sugar, hides, &c., that it is of such consequence to India whether a ship's expenses in port are a shilling or ten per ton on goods.

We cannot proceed further with this subject without an attempt at a really fair estimate of the actual state of India at present with respect to these great essentials, public works. And it is impossible to travel a hundred miles in India without being quite satisfied on this point, that there never was a more astonishing failure in the world than ours has been in our management of India with respect to this, which lays at the very foundation of all improvement. Nay, we cannot land at many places, and, among them, at no less a place than Madras—a seat of government, and a city of 600,000 inhabitants—without unmistakable proof of the unaccountable apathy we have shown about such improvements. This great port is not only at this moment without shelter for shipping, but without any means of avoiding the surf, so that we are still using the very native surf-boats that were found there 100 years ago; and, besides the enormous expense that is incurred in shipping goods, not a year passes without people being drowned in crossing the surf, and the most dreadful wrecks with prodigious loss of life, take place, within pistol-range of the Fort and the houses of the town, under the eyes of the governor himself, and the members of Government. Let us take, next, a district at this moment in the state in which the great mass of the country is now lying—nineteen out of twenty—of the 100 and more districts into which the country is divided. Let us suppose a rich traveller; he sends on, a few days before he starts, to have fourteen men posted at every twenty-five or thirty miles to carry his palanquin, and one pair of baskets to carry seventy pounds weight of

clothes. The bearers are brought from, perhaps, 50 miles, perhaps 100 miles, to their appointed stations. With these preparations he sets out, and manages, if he travels through the burning sun, to proceed at $3\frac{1}{2}$ miles an hour, at a cost of from about eightpence to a shilling a mile. In each district he passes through there is, perhaps, fifty miles of imperfectly made road, on a surface of 10,000 square miles, equal to ten English counties—perhaps not a single mile, excepting the carriage drive at the principal European station. There are certainly some miles of made road, provided with bridges in some districts, and there is one extended line up the Valley of the Ganges, but these do not fairly represent the state of the country—they are very rare exceptions. If our traveller has goods to take up the country, and he stops at 400 miles from the port, they will reach him in six weeks, if they have not been stopped by the rivers, at a cost of £6 a ton.

Now imagine a portion of England without a mile of made road, or canal, or railway; without a bridge, and wholly impracticable to anything but a man on foot or an animal, and even to them for several months in the year; and then suppose this tract of land to be cut off from the ocean by from 1 to 500 miles of similar country, and an idea will be formed of the state of the people in India. For seven or eight months in the year, when the surface is dry, and there is no water in the rivers, goods are conveyed in bullock carts, by stages of ten miles a day, at a cost of 4d. a ton a mile, in a country where money is about six times the value it is here, calculated from the cost of labour and food; so that this charge is equivalent to 2s. a ton a mile in England, and when we add to this, that whereas in this country the distances to be traversed to reach a port or a market, are perhaps one-fifth what they are in India, this cost of transit forms as heavy a tax as 10 shillings a ton a mile would be in England. If we compare simply the cost per mile, without considering the distances, it gives us a totally false notion of the state of the case.

Let us take the instance of a ton of Berar cotton, and compare its cost of transit in India and England. It costs £12, and is conveyed 400 miles for £6, to the Indian port. On its arrival in England, it is conveyed from Liverpool to Manchester for, I believe, 5s.; its inland transit in England, therefore, costs one-twenty-fourth of that in India, but the £6 in India represents 2 tons of human food, and the 5s. in England represents 30lbs. weight of flour, the proportion being as 1 to 150. This is the true way of comparing the state of transit in India with that in England. Now, if we consider what would be the consequence if the tax upon the transit of goods were increased in England 150 fold, we may understand what India is suffering from want of commerce, and this is the actual state of India generally. The exceptions are, that two or three main lines of road, such as the grand trunk road leading from Calcutta up the valley of the Ganges, have been partially made, but even on these many bridges are wanting. In the Agra presidency, in the Punjab, and in Mysore, a good many miles of road, more or less complete, have been made. Only one district, I believe, in all India has been regularly provided with practicable roads, steadily carried on year after year for the last 30 years. So that it has now 1000 miles on a surface of about 5000 square miles; these are almost completely bridged, but the roads are not metalled, though they are practicable throughout the year.

There are also a few miles of railway; about 150 are now open, and they are now proceeding at the rate of perhaps 100 miles a year. They talk of carrying them on more speedily, but all that can be done in this way must be utterly insignificant towards opening India. England has already one mile of railway to ten square miles, and even at this rate it would take 130,000 miles for India. So that if they were to proceed at ten times the present rate, it would take 130 years to open the country even to the extent England is provided with communications of

this kind, and it is evident that even then several hundred thousand miles of common roads, or light railways, or canals, would be required. But further, no extent of railways would answer the purpose. As main lines of communication for goods, railways do not, and never can, answer. They totally fail in the two grand essentials; they cannot convey the quantity of goods required, neither can they convey at the low price required. The Ganges is at present estimated to transport 2,000,000 tons a year, and if the whole country were provided with cheap communications, connecting it with the interior, the traffic would very soon be 5,000,000 tons, while the most crowded railway in England only conveys about 400,000 tons. And as to the cost of transit by them, it seems now clearly ascertained that the railways cannot carry at less than 1d. a ton a mile, including wear, management, and cost, exclusive of interest on capital, if the said railways were worked with fast trains, while for the long distances in India, the cost ought to be reduced to one-tenth or one-twentieth of a penny a mile. In America, on the Hudson and Mississippi, it is about one-seventh of a penny. In England, a very small portion of the traffic is conveyed by rail, probably nineteen-twentieths are carried by water, either by the coast or by canal. Between Manchester and Liverpool, eleven-twelfths of the traffic in goods are by canal, according to the last parliamentary inquiry. On the east coast of England, 3,500,000 tons of coals alone are conveyed, and probably 8,000,000 or 10,000,000 tons of goods in all, while on the Great Northern Railway only 400,000 tons, as before stated, are carried. Were there a canal for 300-ton steam-boats, like the St. Lawrence Canal, between Durham and London, as it could convey goods at about half the cost of coast transit, the goods traffic would be greatly increased, and could be hardly less than 5,000,000 tons a year, the coals alone being at present 4,000,000 tons, producing a saving of more than £1,000,000 sterling a year. How much more unfit would the railways be to accommodate the goods traffic of a continent like India.

But the most remarkable exception to the state of India generally, with respect to communication, is the district of Rajahmundry, before alluded to. The new works there have already provided about 600 miles of connected water communication, and when the works are completed there will be full 1,000 miles. Thus the whole Delta will be provided with one mile of the cheapest communication to every three square miles of surface, and will be thus really and effectually opened out. Of the effect of this upon the people, an idea may be formed from this, that in the principal canal, which was opened in 1851, there passed, last year, nearly 8,000 boats, besides great numbers of rafts of timber and bamboos, in the fourth year, on a line over which there could not have been 5,000 tons moved before. But in a few years, when the whole Delta is opened, there can be no doubt that more than 100,000 tons will pass along it, and when the Upper Godavery is navigated,—and this canal forms the outlet of 130,000 square miles of country, which is throughout provided with cheap transit,—perhaps 500,000 tons will soon be conveyed by it.

Another exception is the opening of the Upper Godavery, here referred to. This case is one of the most striking proofs of the unaccountable misapprehension of the subject of communications shown in our management of India. This magnificent river and its branches, passing through the best cotton country in India, cotton purchased at about 1½d. a lb., a country also producing excellent wheat at from 8d. to 1s. 6d. a bushel, though proved to be navigable by the use made of it by an enterprising European house at Hyderabad, for two or three years previous to its bankruptcy, has been totally neglected by the government, and the petty Zemindars on its banks have been allowed to stop all use of it by claiming whatever tolls they pleased, excepting that timber has been floated down the lower part. With this river passing through the middle of the cotton country, and ter-

minating at a safe harbour, the cotton has all been hitherto carried on bullocks 400 miles, either to Bombay or to the banks of the Ganges, at an expense of £6 a ton, besides risk and damage, while it could have been carried by the river for 10s., if only the Government had attended to it, put a stop to the interference of the Zemindars, and expended a moderate sum in improving its bed. An officer has now, after several years that the matter has been pressed upon the government, been appointed to superintend the improvement of the river. The sum of £5,000 has been placed at the disposal of the Governor of Madras, and a small steamer has been sent out. The engineer has been peremptorily ordered on no account to exceed that amount, which, as about 700 miles of river can be used, amounts to £7 a mile. Such is the view of the value of a river connecting a first-rate cotton and wheat country with the coast, a communication which there is every reason to believe will powerfully affect the whole empire, by supplying England with abundance of cotton.* Some further water communications are also in progress in Madras. Works similar to those in the Delta of the Godavery are under execution in the adjoining Delta of the Kistnah, and a line of canal is being executed from 60 miles north of the Godavery to Cape Comorin, 850 miles parallel with the coast, and connecting the three rivers, the Godavery, the Kistnah, and the Cauvery. A similar line is forming by connecting the backwaters for 300 or 400 miles along the west coast of the peninsula, so that within three years, we may reckon upon having about 4000 miles of connected water communication in the Madras Presidency. In Bengal, the grand canal running along the narrow strip of country between the Ganges and Jumna, for 450 miles, and with its branches measuring in all 850 miles, is also well advanced, and will form a communication of immense importance, though, strange to say, very little account of its use for navigation has been taken, and, perhaps, it will be left imperfect in that respect till the matter of communications is better understood.

There are two points particularly to be observed with respect to the communications:—

1st. That which is doing has been almost all undertaken within the last few years, and solely under external pressure; and, 2nd, that they are only isolated works, that there is not, as yet, any symptom at all of, properly speaking, a system of communication for all India being undertaken.

Nothing worth mentioning is as yet doing in by far the greater part of the districts, nor even any preparations for it.

What has been done, and is now doing, in Rajahmundry or corresponding works, according to the nature of the country should be at this moment going on in every district in India. About ten years will have sufficed to give that small tract of 3,000 square miles 1,000 miles of really cheap communication. If this were done in every district at once—and there is no imaginable reason why it should not—ten years would suffice to provide India with 100,000 miles, which would be at the rate of one mile to every thirteen square miles. The expenditure in Rajahmundry has been about £30,000 a year, and it has almost all been expended on the spot, in quarrying, building, excavating, &c. In other districts a large proportion of the outlay would be on light railways, in which case, perhaps, half the money would be spent on material; so that, with the same amount of money and local labour a much larger amount of improvement might be accomplished.

When I speak of nothing whatever being done towards a systematic arrangement for supplying India with communications, I do not mean to say that people do not

* The sum not to be exceeded is just the cost of half a mile of high-speed railway, so that 700 miles of river navigation, that will carry at from one-eighth to one-fourth of a penny a ton a mile is considered exactly equal in value to half a mile of railway that will carry at one penny, so strangely perverted are the present ideas on Indian communications.

fancy that they are doing this. They continually talk as if what was now doing about railways was really the supplying India with a system of communications; but there could not be a more palpable delusion. Suppose England were surrounded by land instead of water, so that it had no coast communication, that it had no turnpike roads or canals, and that all that was doing was to make half a mile of high-speed railway a year on each of three lines, such as from Southampton to London, from Liverpool to Birmingham, and from Edinburgh to Glasgow, so that, in 100 years, three or four main lines of such railway would be open, while all the rest of the country was waiting for these works; and when the founders of this scheme are remonstrated with, they reply, "Wait a little, we are making a grand experiment; we are trying whether we cannot have perfect communications at once." So they begin in spending five years in laying 150 miles of railway, during which time the country has lost at least 150 millions sterling for want of communications—for this want causes a loss of at least thirty millions a year to India—much more than the whole of the taxes. This is rather an expensive experiment.

I will now proceed to consider the state of the country in respect to its irrigation. This, in fact, corresponds exactly with that of the communications. One single district, Tanjore, has been in a certain sense systematically attended to, almost from our first obtaining possession of it. About 30 years ago, one or two of the old Mahomedan canals in the North-west were restored and improved, and within the last eight years two extensive systems of works—one on the Ganges, and one on the Godavery, already mentioned as communications—have been undertaken, and are both now partially in operation. But, with these exceptions, there is scarcely a district in India in which even the old native works have been fully kept in repair; indeed, there is not one in which multitudes of works (where they exist) are not in every stage of insufficiency down to complete ruin, though in some districts many of the most important have been both kept in repair and improved. Of the consequences of this, in the awful famines that have repeatedly desolated the country, we have had abundance of lessons which *à priori* one would have thought it was impossible that men could help learning from. In one district of Guntoor, in 1833, 200,000 out of half a million inhabitants, perished. On this occasion nothing could induce the Government to move a finger till 70,000 of those starving men, having left their families to perish, invaded the city of Madras, when it was found that *something could* be done; but it was then too late. But I am not speaking only of 20 years ago; only last year there was a severe drought, which gave a certainty of scarcity, and probably famine. The matter was pressed upon the Government, especially with reference to the district of Bellary, where the scarcity was greatest. But nothing could induce the Government to take any really effective steps to provide for the time when the means of the people would be exhausted. The consequence was that 100,000 people had to be fed at the Government expense, without any proper preparation or organisation, and almost the whole of the money so expended was in consequence thrown away. Had preparations been made, 100,000 men in six months might have executed a system of irrigation works which would have secured the district for ever from actual famine, unless under such circumstances as have never hitherto occurred. There are only two districts at this moment in the whole Madras presidency, excepting those I have mentioned, where, if there were such a failure of the Monsoon as has often before occurred, there would not be all the horrors of famine, and this is generally the case throughout India. The way in which the actual state of things has been hidden from the people of this country has been by mentioning two or three works that have been undertaken within the last few years, as representing the general system of management, which is nothing more nor less than a complete deception.

I must, however, give some account of what has been done. In Tanjore on an average about £8,000 a year has been laid out for forty years on public works, and this trifling sum has been sufficient, not only to keep the old works in repair but to pervade the whole district—in a rude way, indeed—with an effective system of irrigation and common roads with bridges; and the results have been that the population has increased from 800,000 to 1,500,000, and the revenue from £320,000 to £500,000, while the other districts have remained nearly stationary. This district has never had even a scarcity; and on every occasion, without exception, of famine in other parts of the country it has poured out enormous supplies of food. While almost the whole of the lands of the presidency are worthless, that is, unsaleable, the whole of the Tanjore lands are saleable at prices about equal to those of England, allowing for the difference in the value of money. The works of the Godavery were commenced 8 years ago, and a large portion of the 1,200,000 acres to be ultimately benefited, are now receiving water, though in an imperfect way. The result already is, that last year, one of severe drought, when all the surrounding country suffered greatly, so that grain was double the ordinary price, the revenue of the district was 25 per cent. higher than the average of years before the works, a difference of £50,000, and the sea exports of produce alone were £170,000 against £30,000 the average of years preceding the works, and this besides the vast exports to the surrounding districts by land.* The cost of these works has been about £200,000, and probably about £300,000 in all will be expended.

A similar set of works is now commenced on the next river, the Kistnah, and they are also partially in operation.

But the greatest work is the grand canal led from the Ganges, from the point where it enters the alluvial country before alluded to. It will cost about 2 millions, equal to 12 millions in this country, so that it is the largest engineering work in the world. It was begun about 8 years ago, and some water has already been admitted, but it is only in operation to a very small extent yet. It is, however, a noble and most important work, not as a work of irrigation only, but as a line of steam boat communication, if it is perfected. As such it will be, excepting the Erie and the St. Lawrence canals, the most valuable communication in the world, and if it were carried on to Calcutta it would be the most important without exception.

The state of the coast in respect of harbours is just the same as the interior in respect of communication and irrigation, Madras is at this moment in precisely the state it was when we first occupied it; there is neither a break-water for the shipping, nor any means for communicating from them to the shore, except by the catamarans and masoolah, or surf-boats, that we found there. Not £20,000 has been spent in all the ports in the Madras presidency. At Coringa, on the east coast, there is a *safe* anchorage, but for want of a dredged channel of 3 or 4 feet deep through a bank, ships cannot get into the river for repairs if they draw more than nine feet. In almost all the ports a master-attendant is paid perhaps £100 or £150 a year, and as it is seldom that an efficient man can be found at such a price, I have known one so employed who was not a seaman, and who was utterly without one qualification for the duties. Such is the astonishing misapprehension of the value of ports to the country.

It must not be supposed that there was not nominally a system of management for public works, but that the department was ludicrously inadequate. In a tract of country requiring twenty Europeans, and an expenditure of £50,000 a year, there would be one European, and an expenditure of £1000 a year. In the district of Rajahmundry, the expenditure had been, up to 1840, £400 or £500 a year, for all the roads, tanks, canals, rivers, &c., and a

* One year the exports of *produce* (exclusive of a small cloth trade) of this, nearly the richest alluvial tract in the world, had actually fallen to £9,000, a tract capable of bearing 2½ millions of people.

fifth share of the time of one engineer, in a district containing 7000 or 8000 square miles, one-seventh the size of England. Now surely nothing can be more obvious than this, that on taking possession of a tract of country, the very first thing should be to form a department and sanction an expenditure adequate to the following works:

1st. To keep in repair all existing public works, such as tanks, canals, &c.

2nd. To provide it with some kind of rough communication with bridges.

3rd. To apply our western science in improving the rude works of the natives.

4th. To extend the means of irrigation till the district was in some degree secure from famine.

5th. To provide some kind of communication superior to common roads in at least a few main lines.

Without this it is absolutely impossible that the country can increase in wealth, and provide the means of instruction, &c., or even for justice, &c. While the whole population of a country is employed in raising food, nothing can be done towards elevating them. England is rich, and can afford to acquire knowledge, because by means of public works so much is done that must otherwise be done by human labour, the necessities of life can be provided by the labour of only a small portion of the community, and there is consequently a vast amount of human labour available for other things. India is poor, because, excepting bullocks, it has nothing that saves human labour, and this lies at the root of all its evils. Its courts of justice are 100 or 200 miles apart, because with the present revenue, the Government "can't afford" to have more. The whole people are in a state of the greatest ignorance, because the government "can't afford" to educate them. It is impossible for any person who has not been for some time resident in India, to conceive the indignation one feels at the sight of these masses of people so utterly neglected. To have some adequate apprehension of this, one had need to have laboured for thirty years among these millions, wholly without the knowledge of anything worth knowing, and generally in the lowest state of poverty, because not provided with those public works which are essential to improvement of any kind, while we had it in our power to bestow upon them a share of all those advantages which we possess in England. Of the way in which the subject of communications has been valued, not fifty years ago, but quite lately, two anecdotes will enable one to judge. A demand was made for £1000 to provide for an expedition being sent up from the Delta to examine the Upper Godavery. Papers by the Civil Engineer, Revenue Commissioner, the Board of Revenue, and others, giving at length information on the subject, showing that it was the natural communication between the coast and ten millions of people, that it opened up the best cotton tract out of America, that 30,000 tons of cotton a year were now sent from it 400 miles on bullocks' backs, that it could supply cotton enough for England two or three times over, &c. This was sent to the government of India, and so utterly insignificant did it appear to them, that they did not think it worth while to answer a single paragraph of any of the papers, but merely replied, in three lines, that they doubted whether it would be useful, and that in the present state of the finances the money could not be granted. At the time that this £1,000 could not be spared to examine a river by which England could be supplied with cotton, there was, according to a letter from the India House to the Government of India, £13,500,000 sterling, in rupees, in the treasury.

The other case is this:—An engineer sent in an estimate of £700, for cutting a few miles of canal, to connect two long lines of backwater on the west coast of the peninsula, on which there was already a great trade. In refusing this, the Madras Government directed the engineer in future to attend to matters of more importance, and not to occupy himself with such things.

Again, in a paper by the Government consulting engineer, Col. Baker, written by order of the Governor-general, on the subject of public works, he sums up his views on the subject in a series of conclusions, in which not a word is said on the importance of giving India generally a system of communication without delay; not a word on the effect of cheap transit, nor a word on the importance of irrigation.

These things show the astonishing misapprehension of the whole subject that still exists on the part of old Indians, and the absolute necessity of bringing the matter under the notice of the people of England, who, not having breathed the atmosphere of indifference to Indian improvement by means of public works for thirty or forty years, are capable of receiving right impressions on the subject.

What I insist upon is this:—

1st. At this moment the great mass of India is without those public works which are essential to the welfare of the people. The works which have been carrying on of late years, in a few localities, viz.,—the Punjaub, Agra, Rajahmundry, and Tanjore, if brought forward, as they constantly are, as representing the general state of India, convey a totally false impression of the actual state of things. They are merely exceptions; and,

2nd. That after all the pressure of English public opinion that has been brought to bear upon this subject, there is as yet no symptom of the formation of a department of public works at all adequate to the wants of the country. As to the great railways, as at present carrying on, meeting the demands of the country, no greater delusion ever existed. Suppose Yorkshire was without one mile of canal or common road, and the inhabitants were told that Government were laying a first-rate railway from Southampton to London, which, in course of time, might be extended northward, so as at last to pass through that county. Such is a correct representation of the case as respects the great mass of India.

Even were it possible to lay 100 miles of these railways where they now lay one, they would not answer the purpose. What would be the state of Yorkshire, even when the railway did reach it? Would a single railway running through it supply the place of its 10,000 miles of canal, light railways, and turnpike roads. It is not one communication passing through a country that opens that country. The whole country must be pervaded by communications. Again, they propose to charge on these railways a penny a ton a mile, corresponding with sixpence in this country. In the first place the Ganges, in its present unimproved state, carries at one-third of a penny a ton a mile, and were it improved, as it might be—were a hundredth part of the money required for a mile of these railways laid out on each mile of the river—it could be worked at one-sixth of a penny. But even where a railway has not to contend with water carriage, as in the case of the valley of the Ganges, what effect will it have upon the distant traffic of the country, carrying at a penny a ton a mile. This on 500 miles would amount to £2 a ton. It is evident, from all that has been written upon these Indian railways, that nobody concerned in them is aware that the railways scarcely touch the distant traffic even in England and America. At a late meeting of the English North-Western Railway proprietors, it was stated that the average receipts were:—

	s.	d.
Per ton of coals	2	3½
Do goods	7	2
Per Passengers	2	8½

I do not know exactly what the charges for coals are, but if we allow only a penny, which is certainly below the mark, they are thus only carried, on an average, 27½ miles. The charges on goods are from 1½d. to 9d.; if we take the average so low as 3d., the distance they are carried is only 29 miles; and the passengers at an average of 1½d. a head, the average distance is under twenty

miles. In *Herapath's Journal*, again, it is stated, that the total receipts in all England for 42 millions passengers is only 3½ millions sterling, which gives 1s. 8d. only per passenger, and allowing 1½d. as the average per mile, it gives an average distance travelled of only 12 miles, showing, at the prices charged on English passengers, how extremely small the amount of travelling is even in this wealthy country on long distances. Again, Lardner gives the average distance that goods are conveyed in America by the railways, at only 38 miles, and adds—“*But little merchandise is transported by them, the cost of transit by them being greater than goods in general are capable of bearing.*” He also shows that in Belgium only 12 out of 1,000 tons are carried more than 100 miles. Again, in all that has been written about these Indian railways, the great fundamental principle of traffic is never once referred to, viz., that its amount on any given line is proportioned to the cost of transit. On the main line of all, that up the valley of the Ganges, it is proposed to convey goods at three times the cost by the river in its unimproved state. But even on other lines, it is merely proposed somewhat to reduce the present cost, as from 1½d. or 2½d. to 1d. But the real question is not, will the railway carry it at a rate somewhat lower than the present rates, but will they carry it at the lowest rates that are attainable. If goods are carried at 3d. a ton, there will be, we will suppose, a traffic of 50,000 tons a year; if on the same line the rate is reduced to a penny, perhaps 100,000 tons will be carried; if to 1-8th of a penny, perhaps half a million, and if to 1-16th, probably a million.

The value and quantity of goods conveyed on any line in India, supposing a million conveyed may be something like this—

10,000 tons of £50 a ton, and upwards.

100,000 tons of £10 and upwards, such as cotton, sugar, saltpetre, iron, &c.

300,000 tons of £3 and upwards, such as rice, salt, &c.

600,000 tons of inferior grains, firewood, straw, building materials, &c.

Nineteen-twentieths of these things would not bear transit for any distance at 1d. a ton a mile; yet upon every ton moved there would be some profit, or they would not be transported at all. It is stated that in the Ganges the traffic is two million tons a year. Were the country deprived of this river navigation, and left dependent on the railway, at least nine-tenths of this traffic would be destroyed, Calcutta reduced to a fourth-rate port, and all Bengal and the Upper Provinces paralyzed, just as would be the case now with Manchester. The railway could not possibly carry a quarter of the present traffic, and if the water communications were destroyed, Manchester would be like a sailing ship becalmed.

Thus nothing is really doing towards the two grand objects, irrigation and the effectual opening up of India. Even from want of the latter alone, though the actual loss is really immeasurable, yet it can easily be shown that the annual loss for want of cheap communication is certainly more than the whole amount of taxes, that is, 25 millions, and, consequently, that at least this sum is thrown away every year that this work is delayed.

What is required is that arrangements should be made for “at once” irrigating and opening up every district in India. There is no shadow of a reason why what is now doing in Rajahmundry should not be at the same time carried on in every other district. The money is procurable, and the European superintendence necessary is also procurable to any extent, and if £50,000 were expended annually in every district, or about five millions a year, within ten years the whole face of India would be changed.

But the money must of course be expended with some sort of judgment. Suppose, instead of watering and draining 1,200,000 acres in Rajahmundry, and supplying it with 1000 miles of water transit, at a farthing or less per ton per mile, at a cost of £900,000, the district had been

left in its former neglected state, and one line of 30 miles of fine railway made in one corner of it instead, would the advantages of this expenditure have been one-hundredth part of those derived from the present works. Would it have raised the revenue by £50,000 a year, and the exports from £20,000 to £170,000 in a few years, and before half the works are in operation? Would the district in the last year—a year of extreme drought—have been selling the largest crop ever produced at famine prices, instead of buying at those, or rather at much higher prices?

All the districts, certainly, could not be improved in exactly the same way as Rajahmundry, because it is a delta, and has peculiar advantages both for irrigation and water-communication, but they ought all to be improved on the same principle; that is, every advantage should be taken of the peculiar natural facilities of each district, to supply it as quickly as possible with these two grand requisites—irrigation and cheap transit. Is not this a palpable principle? But, as a further illustration of the strangely blind way in which the improvement of India has been set about, let us again refer to the case of the Godavery. Here is a river which has already been navigated (for as many months in the year as the Erie Canal is navigable, upon 360 miles of which £6,000,000 sterling has been spent), leading from Berar to a safe port. The work which has been recommended, and upon which already, I believe, £500,000 has been spent, with the proposed object of getting at the Berar cotton, is a railway to ascend 2,500 feet, and then descend 2,000 feet, to be 400 miles in length, to cost about £3,000,000 to £4,000,000, to take from ten to twenty years to construct, and, when finished, to convey the cotton at probably 1d. a ton a mile (the projector estimated the cost of transit at 2½d.); while the river is now available to carry it at one-eighth or one-fourth of a penny a ton a mile, and which may probably be made an excellent communication throughout the year for a tenth or twentieth of what the railway will cost, and convey the cotton at a tenth part of the cost of transit by rail.

Ultimately, the basis of a system of communication for India must be water-communication. Nothing else can meet the wants of India. This is fully proved in America. All the heavy and distant traffic is carried by water. The Hudson, the Mississippi, the Erie Canal, the St. Lawrence navigation, &c., are the only lines that carry a great traffic in long distances. The Erie Canal was first cut as a mere ditch, 360 miles, from the Lakes to the Hudson, for £1,500,000 sterling. In 1840, ten years after railways were in operation, it was enlarged, at a cost of £4,500,000—three times its first cost,—but still worked with animal power. It has been determined greatly to enlarge it, for steam power, that it may contend with the St. Lawrence steam canals, and yet these canals are shut up from five to six months in every year by frost.

Hence, whatever the feeders are, the main communications in India must ultimately be canals or rivers.

But the immediate question is not so much—what is the cheapest mode of transit, as, what are the means by which the main weight of this tremendous incubus, which completely paralyses the energies of India, may be most speedily removed? There can, I think, be but one answer to this. Over by far the greater part of India nothing can be done so quickly as to lay down light railways to be worked at low speed; these can be laid down by thousands of miles in all the populous parts of India, without the least difficulty. Wherever river or canal communications on main lines can be speedily obtained, they should of course be established, and the light rails laid as feeders to them.

In the course of the experience I have had in public works, I have had to lay several miles of light railway in India, which have been worked for years, and in this way I have had good opportunities of learning what was really wanted in a low-speed railway, such as would, at the least expense and in the shortest time, provide the means of getting rid of the greater part of the cost of transit. But

nothing I had tried or thought of satisfied me till I saw Mr. Crosskill's specimen of his railways at Beverley, in Yorkshire. The roads that he had formed exactly met my idea, and I would send out many thousand miles of such roads to India every year. Mr. Crosskill proposes three different kinds of rails for heavier or lighter waggons, and one of these three, I think, would be admirably suited to the different sorts of lines that would occur in India. In some parts of India, near the forests, I would saw up timber on the spot, and only send the iron from England; but for a great extent of country I would send the rails complete with timber, ready to be laid down, and I would have the least possible amount of labour expended on the ground, so as to get the rail into operation as soon as possible.

I should mention that some consideration is beginning to be given to this question of rapidly opening India. A line of light rails has been ordered to be laid from Negapatam, 180 miles south of Madras, to Trichinopoly, due west 90 miles. A line has also been ordered in Bengal, and the Governor-General has lately called upon Col. Baker, the consulting engineer in Bengal, for a report upon the papers I have written upon this subject. In Col. Baker's paper, as I have mentioned, he scarcely touches upon the main points of the subject, viz.:—the effects of very cheap transit; and the enormous loss the country is sustaining every year that it is delayed, &c.; but he says, "The consideration of this question has left me deeply impressed with the importance of the subject, and though I dissent from many of the views expressed by Col. Cotton, and though I dispute many of his calculations, I cannot but feel that he argues from sound principles, and that his plans for the improvement of communications at small cost in some localities by means of canals and rivers, and in others by an inferior class of railway, are eminently deserving of attention." He also calculates that light railways can be laid at one-fourth of the cost, and in one-fourth of the time, that high-speed railways can be constructed; so that he grants that at the end of ten years, for instance, one might have either 1000 miles of high-speed railway or 4000 of low speed, at the end of 20, suppose either 5000 of high speed, or 20,000 of low speed, and so on. If the question was this alone, surely there could be no doubt which should be preferred in a country requiring at least 100,000 miles of main lines, and 400,000 of secondary ones. Col. Baker's paper is the paper of a very candid intelligent man—obliged suddenly to write on a subject of vast extent and importance wholly new to him, so that he had not even time to discover the main points in the question; and at the same time feeling himself on very delicate ground, as the views he was called upon to examine were diametrically opposed to the principles upon which public works are now being carried on in India.

The gentleman who has revenue charge of the district adjoining Rajahmundry, and one side of which consequently receives water from the Godavery works, has lately written a report endeavouring to impress upon Government the great effects of money expended, as it has been there, upon irrigation and canals, and it seems well to make here some quotations from him, to show what is the state of the greater part of the country, and what it may be made and ought to have been many years ago:—

"I have above alluded to the wretched state of the Cuddindyp Pergunnah, (small division of a district), which contains a very large quantity of valuable land, the greater portion of which has long been waste, chiefly from want of the means of irrigation. The average revenue has been £340 per annum. This year an irrigation channel was commenced; immediately tenders for the Pergunnah came in; and it has been given on three years' lease for £700 the first year, £750 the second, and £810 the third," so that the moment the channel is begun the revenue is increased twofold, and within 3 years 2½ fold. He goes on to say—"but no estimates of the quantity of food which has been produced through improved irrigation, no actual return of increase of revenue realised in an ir-

rigated district in a year when such heavy remissions of taxes have been found necessary in other less favoured tracts, can convey any idea of the benefit which has accrued both to the Government and the people, at all to be compared with that derived from actual observation of the effects in travelling through the district. No one could have witnessed, as I did, the wretched condition of the people, and the crops on the Kistnah side of the district, the difficulty of obtaining even the scantiest supply of only moderately impure water, and then have passed to the Godavery side and witnessed with delight the contrast, the abundance of pure water, the splendid crops and the comfort of the people, without being deeply sensible that no figures can at all convey a true idea of the priceless blessing which the waters of the Godavery, brought by means of the weir and channels through such an extent of delta have conferred upon the people. In May I was encamped at Avenguddah on the banks of a large branch of the Kistnah, then a sheet of sand. The cattle were dying by numbers from starvation; no signs of vegetation were apparent; the water was wretched, and I hope I may never again see so much poverty and wretchedness. The month of June was passed by me at Akeed, more than thirty miles from the nearest point of the Godavery, but there fresh water and forage were abundant. The water of the Godavery, which had passed through the head sluice fifty miles up the channel, flowed past my tents, and numerous boats, laden with the produce of the neighbouring lands, daily passed to and fro. Grain was far lower in price than in any other parts of the districts, and I do not doubt that the cost of transit has been reduced to one-third of what it was before. I have already advocated the extension of a canal in continuation of that which passes Akeed to the port of Masulipatam. The same grain which sells at £5 5s. per ton in Akeed brings £6 15s. in Masulipatam. If the canal were continued, 5s. a ton ought to be about the difference, instead of £1 10s."

He goes on to show that there has been an increase of revenue of 42 per cent. on the Godavery side of the district. But may it not well be asked why is this the state of things on one side the district, after we have possessed the country fifty years? Is it only now discovered that public works make the difference between the most abject poverty and wretchedness and abundance and comfort?

It is impossible to touch upon the hundredth part of the points of importance on this subject in so short a paper as this, and the view of it taken here must necessarily be most imperfect. I have endeavoured to select the most essential points, and the following propositions will show, in a small compass, the views which I hold:—

1st. That the greatest possible mistake has been made in our management of India, in neglecting to execute those works of irrigation and communication which lay at the foundation of the improvement of the people, not only material, but also moral.

2nd. That nothing can be more obvious than that in every district, the moment it was taken possession of, a sufficient establishment and expenditure should have been allowed—1st. To keep in repair the old native works; 2nd. To construct new and far more perfect ones, worthy of our superior means and knowledge.

3rd. That the improvements that have of late years commenced in a few districts do not at all represent the general state of things throughout India, but that at this moment the great mass of India is utterly unimproved, and unprovided with those works which are essential to all improvement.

4th. That the construction of a few hundred miles of high-speed railway will not in the least meet the wants of India; that every district ought at once to be supplied with works of irrigation, and pervaded with an extensive system of communication of cheap transit.

5th. That to spend £10,000 on a single mile of communication, when the same time and money could be expended in other ways, so as to produce from 10 to 100 times as much useful effect, is the greatest mistake.

6th. That nothing but canal or river communication can provide India with sufficiently cheap transit for its long distances and the small value of its main articles of transport.

7th. That the grand point of all, as respects communication, is to get any rough works executed to a vast extent over the whole face of the country in the least possible time, so as to relieve it from the tremendous incubus which at present effectually represses all its energies.

8th. That a department ought immediately to be formed adequate to the vast work which has to be accomplished.

9th. That every facility should be given to really free private enterprise. The railway companies at present existing are no more really private companies than the Indian Civil Service.

10th. That while the *value* of water for irrigation is at least £1 for 6,000 cubic yards, it can be provided on a large scale at a cost of £1 for 300,000 cubic yards, or 1-50th part of its value.

11th. That probably steamboat canals can be worked at one-eighth of the cost of working high-speed railways, and improved rivers also at one-sixth or one-eighth of the latter.

God has been pleased to set before us the duty, not to say the unspeakable honour and privilege, of incalculably promoting the welfare of 150 millions of people, one-seventh of the population of the whole globe, and as, according to the laws of His kingdom, it is impossible to do good to our neighbours without benefiting ourselves, there has been, at the same time, necessarily placed before us the opportunity of immensely increasing the glory and power of the empire, by raising five-sixths of its population from a state of abject poverty, ignorance, and despondency, to that of a thriving, wealthy, educated, and Christianised people. But hitherto, though we have indeed given them internal peace, we have entirely failed to be the instrument of conveying those blessings to them that as a civilised and Christian nation we ought to have done. But I do feel confident, that in God's good providence, the time is at hand when we shall arouse from our torpor, and introduce a new order of things into India, an order of things which will effectually prevent the natives pointing to the ruined tanks and weirs, and remarking upon the superior abilities and benevolence of their own great rulers to us, when in so many instances we have not even kept their noble works in repair.

Here lies before us now in India an unbounded field for the utmost display of the energies, the science, and the benevolence of England, and an equally unbounded field for the employment of her capital, and the improvement of the supply of all those raw materials which are required for the still increasing development of her manufacturing powers. And it must be remembered that in proportion as the natives of India become sellers of their own produce, they must necessarily become purchasers of our manufactures, and thus also will our care for our fellow subjects necessarily return in extensive benefits to ourselves.

To give some idea of the comparative cost of transit by different modes, I add a statement of the actual rates on various lines of communication:—

OCEAN TRANSIT.			
Land miles.			
London to Calcutta, 15,000—outward	£1 10s., or $\frac{1}{3}$ d. a ton per mile		
Do. do. homeward	3 0 $\frac{1}{3}$ d.		
COASTING.			
In India 200 to 500 miles ...	$\frac{1}{3}$ d.		
Colliers in England ... 350 " ... 9s.	$\frac{1}{3}$ d.		
Steam do., as stated at late C. E.'s meeting	4s.	$\frac{1}{2}$ d.	

RIVERS.			
Ganges (by men)..... 500 to 1000 miles	$\frac{1}{4}$ to $\frac{1}{8}$		
Do. 100 "	$\frac{1}{4}$ to $\frac{1}{8}$		
Mississippi (steam)..... up to 2500 "	$\frac{1}{4}$ to $\frac{1}{8}$		
Hudson do. 160 "	$\frac{1}{4}$ to $\frac{1}{8}$		
Indus do. 500 "	$\frac{1}{4}$ to $\frac{1}{8}$		
Do. do. " down do.	$\frac{1}{4}$ to $\frac{1}{8}$		
Ganges do. 700 "	$\frac{1}{4}$ to $\frac{1}{8}$		
Do. do. " up stream	$\frac{1}{4}$ to $\frac{1}{8}$		
Do. do. " down do.	$\frac{1}{4}$ to $\frac{1}{8}$		
Weaver Navigation, in England (animal power)	24 "	$\frac{1}{4}$ to $\frac{1}{8}$	
CANALS.			
Rajahmundry Canals, men, 20 to 80, no tolls ...	$\frac{1}{4}$ to $\frac{1}{8}$		
Madras Canal, men, 40, including toll	$\frac{1}{4}$ to $\frac{1}{8}$		
Erie Canal, animal power, 360, including heavy tolls	$\frac{1}{4}$ to $\frac{1}{8}$		
St. Lawrence Canal, steam, 700, including tolls	$\frac{1}{4}$ to $\frac{1}{8}$		
English Canals, animals, without tolls	$\frac{1}{4}$ to $\frac{1}{8}$		
Do. do. with tolls	$\frac{1}{4}$ to $\frac{1}{8}$		
RAILWAYS.			
In England, steam, 10 to 200, with tolls	$1\frac{1}{4}$ to 9d.		
Do. mineral lines with low speed, 10 to 30, with tolls	1 "		
In America, steam, moderate speed	$1\frac{1}{4}$ "		
German States, steam	2 to 7 "		
France, steam	$1\frac{1}{4}$ "		
East Indian, steam, proposed	1 to 2 "		
Belgium	$1\frac{1}{4}$ "		
English Railways, actual cost of working (1847), according to Lardner	$1\frac{1}{4}$ "		
COMMON ROADS.			
In India, bullocks	$1\frac{1}{4}$ to 4 "		
Passengers by English railways	$1\frac{1}{4}$ to 3 "		
Do. on the Hudson, at 20 miles an hour	$1\frac{1}{4}$ to 3 "		
Do. by sea, from London to Edinburgh	$1\frac{1}{4}$ to 3 "		
Do. on the Rajahmundry Canals, in boats worked by men	$\frac{1}{4}$ to $\frac{1}{8}$ "		

It thus appears, that by far the cheapest transit is that by the ocean on long distances, and is from one-twentieth to one-fortieth of a penny per ton per mile; that the next is by inland steam navigation, being about one-sixth of a penny when there are no tolls; and in the St. Lawrence canals, one-third of a penny with tolls; that in the Indian rivers it is from one-third to three-fourths of a penny, worked by men; on Indian canals from one-sixth to one-fourth of a penny, also worked by men, and for very short distances. On long distances this would, of course, be reduced to perhaps one-half, or from one-twelfth to one-eighth, and on canals suited for steamboats of considerable tonnage, certainly less than these rates, or probably one-sixteenth of a penny. By coasters, on distances of from 300 to 500 miles, about one-third of a penny both in India and in England, and it is stated that by steam coasters the actual expense would not be more than one-seventh in the latter. By canals worked by horses in England, the actual cost is stated by a canal manager to be one-third of a penny, exclusive of toll. On the Erie canal, open only six months in the year, and yielding very large profits, worked by animal power, seven-eighths of a penny, including toll.

By railway, as far as I can ascertain, the actual cost of transit, including a fair share of all expenses, where the railway is worked by quick passenger trains, as in England, at least one penny. On a mineral line, worked at six miles an hour, I was informed that it was rather under a penny; the cost of trucks alone, at that low speed, was stated to be from one-eighth to one fourth of a penny. If the coasting trade can be carried on at one-third of a penny by sails, and at one-seventh of a penny by steam, certainly a steam-boat canal, for vessels of 300 tons burthen, like the Canada canals, could, in England, be worked at one-tenth of a penny a ton, exclusive of tolls, for distances of 100 miles and upwards; and in India they could probably be worked at one-sixteenth of a penny for long distances. They reckon upon charging on the railway in India at least a penny, which is probably eight times what would be charged on steamboat canals, including tolls, and six or eight times as much as improved river navigation would cost there.

The Indian mail just arrived contains a remarkable case in confirmation of what I have said of the strange misapprehension of the subject of communication:—

"The Indigo Planters' Association have just remonstrated with the Government upon an extraordinary case of this kind [neglect of public works]. The communication between Calcutta and the Ganges is by two canals. One of these, called the Eastern Canal, has long been closed, so that the native traffic of this large city (stated in the railway pamphlets at two million tons a year) is confined to the other. Its length is 2½ miles, and its condition is such, write the Association, *that it ordinarily takes 9, 11, and even 13 days to effect a passage through it.* They further go on to state, that the road to it is so blocked up, that it cannot be got at; that the canal is in such a foul and fetid state as to be highly injurious to public health; that the tolls yield a large surplus revenue to Government; and that heavy demurrage rates have been established on boats remaining more than two days in the canal, though, owing to the neglect of Government, it is in such a state that it takes from 9 to 13 days to pass through it."

This is represented to be the state of things in the case of a work under the very eyes of the Government, and through which the whole trade of Calcutta with the interior passes.

By the same mail also it is reported that one short step has at length been taken in the right direction. A loan of 2½ millions has been opened, to be expended in public works in India.

DISCUSSION.

The CHAIRMAN said, it was now his duty to invite the observations of the meeting upon the paper they had heard read.

Mr. GREGSON, M.P., said, it was impossible to digest all the various points contained in the paper, and he should therefore confine himself to a few notes which he had taken during the reading of it. The subject appeared to be divided into three principal parts, viz., irrigation, communications, and harbours; and with regard to irrigation, the gallant gentleman had stated the reduction in the cost of water which could be effected by the system he proposed to be,—that whereas £1 was now expended upon 6000 cubic yards of water, the same amount would be sufficient for raising 300,000 cubic yards, which he thought was a most astonishing extent of improvement. Then, again, the advantages of this irrigation had been most ably and clearly pointed out, and that the necessity for this irrigation existed for the purpose of increasing the production of food was most evident, because, without referring to the more recent instances of famine, the whole history of India pointed out that that country had always been more or less affected by the most dreadful famines. With regard to India it always appeared to him that ever since that country had fallen into the hands of Europeans it was the duty of the Government to take serious and important steps towards procuring an increased supply of food, inasmuch as famines had occurred at different periods of the history of that country—sometimes extending nearly over the whole country, and at other times over only certain provinces. In the third year of the reign of Aurungzebe a dreadful famine occurred. He (Mr. Gregson) did not know whether the present Government did what was then done by that ruler. He remitted the rents and taxes of the people; his treasury was thrown open without limit; corn was conveyed from the districts where it was cheapest to those where food was dearest, and so great was the economy practised, that, laying aside the expenses and luxuries of a court, affairs were so ably managed that every district suffering from the famine was supplied by a reserve from his own treasury. They had heard that as many as 200,000 of the population had perished in one year (1833) through famine, and last year the Govern-

ment, it was stated, had to employ 100,000 people in order to provide them with the means of existence, at an expense of £1 per head, whilst they had heard from the gallant gentleman that the expenditure of £100,000 in works of irrigation, would have for ever prevented famine in that district. The next point he would notice was a most extraordinary statement by the gallant author of the paper, with regard to the roads in India. They had been told that cotton, which could be purchased at 1½d. per lb., cost £12 and as much as £6 per ton to convey it to the port for shipment, whereas it was stated that by the improvement of the river navigation the charge of transit would be reduced from £6 to about 10s. per ton. They had heard that only two or three improvements had been made in the valley of the Ganges; and with regard to the railways, they were told that at tenfold the present rate of progress it would require 130 years to produce the same means as now exist in this country. It seemed to him most extraordinary that no improvement for a hundred years had been made in the harbour of Madras, but that they were still using the primitive surf-boats at the cost of many lives every year for want of a small improvement there. The results of improvements in India had been strikingly exemplified by the fact stated by the gallant author of the paper. In one province, where public improvements were carried out, the exports increased from £30,000 a year to £170,000, and, in another instance, the revenue from £320,000 to £500,000, and, moreover, no scarcity of food had occurred since those works had been carried out. The gallant author had also mentioned that an engineer was authorised to carry out works to the limit of £1000 a year, whilst he (Mr. Gregson) ventured to say the salary of the engineer himself was £2000 or £3000 a year. With respect to the canal of the Ganges, that appeared to be a very great work, and was a great credit to the government, and, perhaps, with the assistance of his hon. friend in the chair, improvements had been carried out which would not otherwise have been effected. He differed from the gallant author of the paper in the statement that the £2,000,000 expended upon the canal of the Ganges was equal to an expenditure of £12,000,000 in this country; he thought £5,000,000 or £6,000,000 would come nearer to the real state of the case. He fully agreed with the gallant gentleman that India presented an ample field for the exercise of the science, the energy, and the benevolence of England. He (Mr. Gregson) had resided in that country, and he took a deep interest in all that concerned it, and he had still many friends residing there. The natives were the most gentle and tractable people on the earth; they had, moreover, climate, soil, and every other advantage, and he hoped the Government had taken steps to improve the advantages within their reach. The order of improvement he thought should be thus:—1. Irrigation. 2. Improvement of native works. 3. Communication by bridges and roads. 4. All works to be kept in repair. 5. Superior water and land communication. He hoped this would be the object and aim of the chairman, deputy chairman, and every director of the Hon. East India Company; for, after all, it must depend upon them to advance the interests of this important country, inasmuch as when the proprietors of the stock received their dividend it was to be feared that they did not take much interest in the welfare of the country. He had heard the remark made that we cared very little about India, but that we sent young gentlemen there to pick the pagoda trees, and to come back with the liver complaint.

Mr. AYRTON said, the importance of this subject induced him that evening to offer a few observations to the meeting, and he would simply address himself to some of the remarks which had fallen from the gallant author of the paper, because he apprehended the object of this discussion was to investigate truth, and not to support any one theory in particular, but, if possible, to elicit from con-

flicting opinions what measures would be most beneficial to the people of India. He thought the gallant author had commenced his paper under the influence of a theory of his own, which had pervaded it to the end; and although he (Mr. Ayrton) concurred in much that he had said, yet he believed that in some material particulars the theory had been too generally and extensively applied to India. The gallant colonel committed the error which most people fell into when speaking of India—viz., he had suggested a general theory for the whole of India, which was only applicable to certain districts, whilst that vast country, extending over so many thousand miles, was affected by circumstances varied and conflicting, embracing not merely immense kingdoms, but people of different nations and languages, and geological features as different as the lowlands of Holland are to the Alps of Switzerland. It likewise embraced a variety of soil, climate, and temperature, proportionate to its vast extent of latitude, from the Indus to Cape Comorin. It might almost be assumed, that any general theory for the whole Indian empire was sure to be wrong. What would be a good system for the lowlands would not be practicable for the uplands. The uplands comprised the whole of the mountain districts, also the highlands and hill-lands of Central India, much of which constituted the most fertile portions of the country. No theory of a canal adapted for Madras or the level valley of the Ganges would be applicable to the upper districts, or the highlands of India. To suppose that a canal could be carried over a district to a summit of 500 feet, was to state that which in an engineering point of view was impracticable. What was the usual characteristic of most of the rivers in India? In the first place they were influenced by periodical rains; they were not rivers fed by perennial showers, rising and falling within narrow limits, but they were one day small streams, and another mighty torrents—at one time mere gravel beds, with here and there a rill of water, so that they might be crossed on foot, and at other times impassable even by boats. They could not use the rivers for the purposes of navigation if at one moment they swept along impetuously, and the next were all but dry. Still less could they be used for profitable navigation for the transport of the produce of the country, for at the season of the harvest the rains ceased, and the rivers began to fall, and the beds of the rivers were dry, and impracticable for the purposes of transit when the harvest was made and the produce was ready to be transported to market; then, in fact, there were no rivers at all. He would illustrate the question by a particular instance. Looking at the map of Calcutta, they might assume, by a too hasty generalisation, that the region far around it was a level admirably suited for canals; and though this was partially the case, yet if they were to examine the Damooda river, which flowed from the Ranegunge coal-fields to the Hooghly river, and were to visit that great source for the supply of coal to Eastern India, what would they find to be the condition of things there? That splendid coal-field was by the side of the river, on the banks of which, through eight or nine months of the year, they stored the coal in stacks—they were obliged to get the boats up when they could; this, he it remembered, was at a distance of 70 miles from Calcutta. They waited for the periodical rains and the river floods; they hurried the coal into the boats, and if Providence helped them, they got the coals to market. But sometimes the boats could not make even that voyage, to reach only a direct distance of 70 miles. As they proceeded downwards on their journey the river began to fall, and they were obliged to throw coals overboard for want of sufficient water, and in some cases the whole cargo was thus sacrificed. The consequence was, at this short distance from Calcutta, with a large river running from the coal-fields, there was no reliable means of transport, and the only remedy for that was in the railway which was now constructed, for they were aware that a river subject to great floods could not easily be made into a canal, and if a river was so steep in its descent, and subject to

such difficulties as these, that might be taken to be a district in which canals could not be economically made, but they would be far too expensive in construction to surmount the difficulties of an engineering character, and to fulfil the purposes required. The meeting must not judge of this matter by their experience of the state of things in a country like England, where a meandering stream, running through a level valley, could be dammed up and converted into a lake or a canal. That was not the case in India. Again, the author of the paper, who had enlarged so much upon the advantages of canals, had ascribed to them results and benefits which he thought they did not deserve, and this meeting ought not to go away impressed with his views, without more accurate evidence than had yet been given of what would ensue from these works. The author apprehended in canals a remedy for famine. Canals, as applied to irrigation, would be no remedy for famine. The rice, wheat, and other varieties of grain, would not be raised by artificial irrigation when they could be grown by the showers of Heaven without cost. The great staple food of man and cattle in India would be produced by those crops which were given by the bounty of Providence from the sowing of the seed, and by the action of the periodical rains upon a naturally fertile soil. It was to be remembered that produce did not fail till all the mischief was done, which no artificial irrigation would remedy. When the husbandman sowed the seed, he was under the expectation of the ordinary periodical showers; he waited for them from day to day, and if they failed then famine had arisen, and no system of irrigation would ever prevent the calamity. He saw some gentlemen shake their heads. He was not going to enter upon a long argument on this subject, but he merely threw it out for the consideration of those who wished to pursue it further, and to point out to them a different view of the question. But the real remedy for famine consisted in improved communications. Famine was rarely, if ever, general throughout India. It occurred in particular districts where the rain had failed, and the remedy for the evil would be found in the means of easy transit, whereby the superabundance of one district might supply the failure of another. He must be allowed to correct what he considered another serious error of the author of the paper. In speaking of improving the rivers of India, and using them for purposes of transit, he forgot to tell them that some of the largest rivers, such as the Taptee and the Nerbuddah, were wholly impracticable, and never could be made navigable. He (Mr. Ayrton) knew that they had been surveyed and examined, under the direction of the Government, for that purpose. They would find that these rivers, large as they were, were of the character which he had described—at one period sweeping everything before them, and at another time having their beds almost dry; and it would be a misapprehension of the geographical features of the country to compare rivers like these with the constant and sluggish waters of the Mississippi and other rivers of America, which afforded great and reliable facility for transport, but with which the rivers of India should never be compared; therefore, he with deference recommended gentlemen to receive the suggestions of the gallant author with the limitations that were necessary to be imposed on them. Canals were only applicable to certain districts of India, and when the gallant author referred to railways ascending to a height of 2,500 feet, which, however, should have been 1,900 feet, and descending to the same extent, they would see that in many cases railways would be more economical than canals, inasmuch as a railway could be carried up to those heights without difficulty, and at a moderate cost, if they were content with a low speed, but water, finding its own level, required a plain for a canal, and where that did not exist naturally, it could only be obtained by artificial works at an enormous cost. The moment they came to the undulating hills and mountains of India, wherever the rise and fall exceeded the limits of economical construction for canals, then they must be superseded by other

means of transit; those means, he contended, could only be by railways. He would not speak of the carrying power or economy of railways for purposes of transit, because the meeting must be as well acquainted with that subject as himself, and could therefore judge of the extent of error into which Colonel Cotton had fallen respecting them. He thought the gallant gentlemen had also fallen into the error of undervaluing the advantages of the proposed railways for India, because their mileage was small for our great extent of territory there, compared with the mileage of railways in this country. The value of a trunk railway in a country thinly-peopled, like India, was one thing, and the value of railways radiating through a manufacturing country like England, where at very short distances were great seats of productive industry, was a totally different question. A railway through the interior of India alone would accomplish enormous results. It would, in fact, connect districts and kingdoms with the great ports of trade. They might leave the village roads as they were, to take care of themselves. Those roads would no doubt be improved in India locally in due time; they interposed little difficulty to the transport of merchandise, which was the great question under consideration, for, as regarded the agriculture of India, when the harvest was made, the cultivators had their cattle all around them, ready to be employed to transport their produce, which they could convey to any point within their own district or country at scarcely any cost, and then they would place it on the great trunk line of the country; but the difficulty began when the produce was to be conveyed hundreds of miles to a distant port by a separate class of carriers, and the transport then became a heavy charge on the produce, before it reached the market, therefore they must not suppose that railways could do nothing for India. He contended that, leaving out of consideration all ramifications of a railway system, which must, of course, be dispensed with over a large extent of India, the mere construction of one or two thousand miles of railways through the heart of India would accomplish enormous results, results which would surpass their imagination. They would by railways alone make, as it were, a Mississippi from Bombay over the ghauts as a means of transit into the centre of India; and however much Col. Cotton might deery them, he (Mr. Ayerton) held them to be the most advantageous means of transit that could be adopted in that part of our Indian empire.

Mr. CORNELIUS NICHOLSON, in addressing a few observations to the meeting, would state at once that he was officially connected with one of the companies prosecuting railways in India, and would, therefore, speak of the subject in a practical point of view. The object of this discussion was, he apprehended, to elicit the truth, and he had risen with a view to correct one or two of the statements contained in the gallant colonel's paper; and in order to make himself intelligible, it was necessary for him to refer to the diagram which was before the meeting. In order that the gallant colonel's theory of water-communication might have all possible force, of course he had put down on the diagram the *smallest* quantity of railways that he said had been contemplated by the Government. He had said, in broad terms, there was no "system of communication" contemplated by the Government and the railway companies, which, he added, were not in fact private companies at all. In order to show what was contemplated by the Great Indian Peninsular Railway Company, the one with which he was connected, the gallant colonel had exhibited to them a line running from Bombay and terminating in the Berar cotton field. He also pointed to the Scinde railway, which had just been projected, proceeding till it met the Indus; and he pointed to a third leading from the Hooghly, at Calcutta, up to Mirzapore, also another line from Madras (no, he found the gallant colonel had left that out entirely), but there was a small portion of a tram railway which was put in the diagram subsequently. He would, with the per-

mission of the meeting, mark out the system of railways that had already received the sanction of the Indian Government. To the great and lasting credit of Lord Dalhousie, since he had held the office of Governor-General of India a grand system of railway communication had been laid down, which had received the sanction of the authorities at home, and was now in course of construction. It was quite true that in the mind of Colonel Cotton, and other persons, some blame attached to the Government for not having sooner prosecuted railways in India, and because these works had not been pushed on more rapidly than they had; but they must remember that railways, when first prosecuted in England, did not proceed at a very rapid rate. The Liverpool and Manchester Railway was spoken of in 1826; it was four years before that experimental line was opened, and it was not till five or six years afterwards that others of the principal lines in England were opened for traffic; so that it might be said that railway communication in England was not opened out until nearly ten years after the system was first projected. It had been five years since railways in India were set on foot, and within that period they had 150 miles opened. There would be fifty miles more opened in Bombay next year; there would be seventy miles in Madras, and 150 miles more opened next year in Bengal; and he hesitated not to say, in opposition to the statement of Colonel Cotton, that at the rate they were going on *at present* it would not take 100 years to give sufficient railway accommodation to India. There were now five companies authorised, and in less than ten years from this time there would be 4,000 miles of railway communication in operation in India. First of all there was the Bengal line, passing up the valley of the Ganges, having a branch to the Ranegunge collieries, and passing on to Agra and Delhi. That line was sanctioned by the Government. Now from Bombay, the line proceeded to the western ghauts—which were represented to them as insurmountable—almost wholly impracticable. They were intended to be crossed by two lines, one to the north-east through the Thul ghaut, which was crossed, not at an elevation of 2,500 feet, as the author stated. It then extended into the Berar cotton field, across the peninsula, to join the Bengal line at Mirzapore; so that there was a complete line of railway communication sanctioned between Calcutta and Bombay. The other line, commencing at Bombay, bi-forked near Callian, crossed the Bhor ghaut, and proceeding to Poonah, was now in course of construction as far as Poonah; there it stretched on till it met with the Madras railway on the frontiers of the two presidencies of Madras and Bombay. The Madras line met the Bombay on the borders of the two presidencies. There was also another line from Madras to the western coast, almost in a straight direction across the peninsula. Then there was again another line recently sanctioned from Surat, which proceeded in the first place to Baroda, and was intended ultimately to join the Bengal line at Agra. The Scinde railway would bring the traffic from the Indus—and he begged them to notice this argument, viz., the fact of that railway being established *after* the most minute inquiry and investigation, was sufficient proof that the mouths or deltas of the rivers which had been referred to were not adapted for water conveyance, or else those railways now projected would never have been thought of. From the west they had, or would have, three lines across the peninsula, a system of about 4000 miles of railway communication, and five companies were now engaged in surveying and constructing these lines, and if they proceeded no faster than they were doing at the present moment, or than they had done during the last year, in the next 10 years 4,000 miles of railway would be opened in India. One other point he would allude to. The gallant Colonel had stated that cotton was now produced at Berar at 1½d. per lb., which cost about £6 per ton for conveyance to the sea-board, east or west, but that hereafter, by the Nerbuddah or the Godavery being made navigable, it could be carried at 10s. per ton, that

was 500 miles of water communication at 10s. per ton. He would take that data of 10s. per ton, and he must now state that it was 160 miles from Bombay to that same point in Berar, and a penny per ton per mile for 160 miles amounted to 13s. 4d.; thus they would bring for 13s. 4d. to the best and nearest ports, in 8 hours, that which Colonel Cotton would bring 500 or 600 miles to Caringa, or to the Bay of Bengal, on the east coast, for 10s. per ton! But all this was contingent upon those rivers being *made* navigable, which they were *not* at present, and, at a moderate calculation, it would take several weeks to convey the cotton to Caringa. With regard to the ghauts, the gallant colonel seemed to look upon them as an insurmountable barrier to railways, but they had only to go from London to Glasgow to find a nearly analogous case—the Shap Fells. It was not a position of altitude above the level of the sea; they had, in reaching the ghauts, overcome half the altitudes of these hills. The worst gradient they had was 1 in 38, for 3½ miles, and that was the gradient to which the company would have to adapt their engines. But any one who had travelled between Birmingham and Bristol—and he presumed most present had done so—had been carried up a gradient of 1 in 37, with one engine, at the rate of 15 miles an hour! Therefore, there was nothing impracticable—nothing extraordinary, either in the cost of construction, or in the way in which they surmounted the ghauts. With regard to the cost of construction of railways in India, the gallant colonel had fallen into a great mistake. He had mentioned £20,000 per mile, whereas he (Mr. Nicholson) could tell them that they had constructed 120 miles of railway on the Bombay side at a cost of £8000 per mile, and that £8000 per mile *included* the heavy works at the ghauts, which had been proclaimed to be impracticable. Therefore, he said there were no unusual difficulties to be surmounted in the construction and working of railways in India, and whatever was due to the gallant gentleman (and much was undoubtedly due to him) for the way in which he had brought the subject of water communication in India before the public in England, he ought not, in seeking to do justice to his own theory, to do injustice to the subject of Indian railways.

Col. SYKES said, having been honoured with an invitation from the Council of the Society to be present on this occasion, he had great pleasure in responding to it, and he appeared there as Colonel Sykes and an old Indian, to express his opinions upon the subject under discussion, and not as the deputy-chairman of the East India Company. Colonel Cotton, unquestionably, had greatly distinguished himself by his zeal, his energy, and the enlarged philanthropy of his views. He believed that he was most anxious to promote the well-being of the people of India, and to advance their material interests; but in doing so, he thought Colonel Cotton had generalised from particular facts in a manner that exposed some of his deductions to question. He appeared to regard India as a country like England, with a dense population tolerably uniformly dispersed, exercising industrious commercial pursuits, great mechanical ingenuity, and powers of production in every branch of art; with great available capital and disposition to social combinations; whereas, the population was not found dispersed over the country with anything like a degree of uniformity; in one part they might find a density of 700 to the square mile, and in other parts they would not find 7, masses being divided from each other by impenetrable jungles; there was little mechanical ingenuity, little disposable capital, and aversion from social combinations. It was unphilosophical, therefore, to draw contrasts unfavourable to the progress of the social and economical arts in India, from what were become normal conditions in England. On the subject of generalisation from particular cases, he would instance the following:—The gallant officer had used these expressions, “Thus nothing is really doing towards the two great objects,—irrigation and the effectual opening-up of India.” And

again he said “That the greatest possible mistake had been made in our management of India, in neglecting to execute those works of irrigation and communication which lay at the foundation of the improvement of the people, not only material, but also moral.” And what was the character of the illustrations he had given in support of these broad assertions? One was that the government had done nothing for a harbour at Madras—that the surf-boats were still used on that coast, that it remained in the same state as for hundreds of years past; and he argued, because surf-boats were not superseded, *ergo*, nothing had been done in India. But what were the facts? Some years ago, a company was got up, and attempts were made to run out a pier through this surf. The character of the soil was ascertained, over which the surf beats, piles having been driven to see whether a platform could be put up. It was found that the piles were forced out by the action of the surf, and came floating back again to the beach. The project was impracticable; and great part of the Coromandel coast presented the same physical difficulties to the construction of piers and harbours. Could the Government be justly blamed for not carrying out impracticabilities? Take one other illustration. It was asserted that nothing had been done to open the rivers of India to navigation, and the upper part of the Godavery was instanced. No doubt the gallant colonel was acquainted with the geological character of the Deccan—a trap region, extending from the Western Sea to Nagpoor, and lying in tables at different levels, and not with a gradual incline. The bed of the Upper Godavery, in the Valley of Arungabad, was 1,500 feet above the level of the sea! In the Monsoon months the river became a furious torrent, that would almost sweep away hills before it, and in the dry months, which were eight months out of the twelve, it was scarcely more than a trickling stream, over which, in some places, one might pass dry shod. But the river had to descend over a succession of terraces, one below another. The rocky margins of these terraces offered impediments to the descent of the water, and would necessarily be obstructive to navigation; but they kept back the water in many places in the bed of the river, so as to form, as it were, great lakes, called *dhaos* by the Mahrattas, and which served for the purposes of irrigation, but if these barriers were swept away upon the plan suggested by Colonel Cotton, the river would run completely dry during the hot months of the year. But the barriers to which he had alluded might be made good use of if they were converted into so many locks to preserve the great backwaters, and to admit of the descent and ascent of boats upon the principle of the Caledonian canal. He doubted, however, whether it would be worth while to insure navigation by such means. Was the government to blame because it did not surmount physical difficulties of the kind described. Colonel Sykes spoke only of the Upper Godavery,—he knew nothing of the lower parts of the river. Another assertion of Colonel Cotton's was, that the great public works of the native princes of India had been suffered to fall into decay and ruin under British rule and management. If Colonel Cotton could point out a single public work of that kind north of the Kistnah, it was more than he (Colonel Sykes) was aware of. He believed that with a 50 years' acquaintance with India, and having traversed it from Delhi to the Kistnah, he might possibly have seen more of that country than the gallant colonel himself, and he must say that he never met with one of these Mahomedan works, (and they were all Mahomedan north of the Kistnah), that had been allowed to fall into decay by the neglect of the British Government. They had been, in fact, ruined a hundred years before the country came into British hands, under the exterminating wars of the five insurgent kings of the Deccan, in the decline of the Mogul power. Candeish, which was a very rich district, had been full of those works, but they were all destroyed before that territory came into our possession. There was always a

risk of defeating admirable objects by generalizations that could not be borne out. With respect to the statement that nothing was really doing in India, he might mention, in the first place, that there were three departments of public works in active operation under the three different governments of India, for the purpose of opening up roads, extending canals of irrigation, and for forming railways; and these departments were under a responsible supervision.

Mr. DICKINSON, hon. secretary to the India Reform Association, said he merely wished to address a few words to the meeting, in consequence of a remarkable incident which had occurred to himself within the last forty-eight hours, with reference to this subject, but the misrepresentations which he had heard that evening had been so extraordinary, that he must notice one or two of them, to give an idea of the way in which interested parties attempted to answer Colonel Cotton. The gentleman who had just sat down, Col. Sykes, had cited as an example of Col. Cotton's unfairness towards the Indian Government, his charge of their neglecting to open, at a comparatively trifling cost, the navigation of the Godavery to the cotton country of Berar. Whereas, said Col. Sykes, this river, being 1,500 feet above the level of the sea, in the valley of Aurungabad, descended from thence, during the monsoon, in "a torrent powerful enough to sweep away a mountain" if it obstructed its course, and in the dry season had its bed entirely dry in the intervals between the different levels of the trap rocks over which it flowed, and stood in pools above those successive shelves of rock. Now, he (Mr. Dickinson) should like to know what on earth this description had to do with the navigation of the river to Berar? Col. Cotton talked of navigating the river to the cotton country of Berar, and the highest level of the river to that point was 420 feet above the sea, or the height of the Grand Junction Canal, at Tring, above the Thames. Col. Sykes answered him by describing the state of the river where it was 1,500 feet above the sea, and said how unfair to propose the improvement of the navigation of such a river! Why, nobody that he knew of had proposed to navigate the river in the part described by Col. Sykes; but the lower part of the river, referred to by Col. Cotton, had been navigated both in the dry season and the monsoon, and there was a gentleman in the room who had been up and down it several times. The next thing he wished to notice was an assertion of one of the railway advocates, who had addressed the meeting on the same point. He said, "Col. Cotton proposes to open a river to the cotton and wheat country of Berar, because, he says, it would require the construction of 500 miles of railway to reach this district. So far, however, is this from being the case, that our railway is sanctioned, and will be completed in a few years to Malligaum, the very centre of Berar, which is only about 150 miles from the sea." Now, there were gentlemen sitting in the room who had been officially employed in the country, and could corroborate what he was about to say, when he informed the meeting that Malligaum, so far from being in the centre of Berar, was actually not in Berar at all, but in Candeish, about 250 miles due west of the centre of Berar. This was a fair specimen of the dependence that was to be placed on all the other statements of the railway gentlemen who had addressed the meeting that night, but, as he could not go into them at that late hour, he would at once conclude by mentioning the incident which induced him to address the meeting:—A native gentleman called on him, on Tuesday, whose name and family would be known, probably, to every person in this room, for his father, Mr. Dwarkanauth Tagore, resided for years in England, was intimately known to the best society in London, was a personal friend of all the leaders of our political world, and was certainly one of the most accomplished men who ever visited this country. His son, Mr. Mohun Tagore, was introduced to him (Mr. Dickinson) by a Calcutta barrister, as one of the most highly-educated and intelligent natives of India

at the present day. Well, in the course of conversation with this gentleman, on Tuesday, he happened to ask Mr. Tagore a question about Indian finance, when he at once interrupted him by saying—"Oh, as for the finance difficulty, I consider it entirely settled and disposed of for ever by Col. Cotton's book on 'Public Works in India.' He has proved to demonstration that the government can make as much money as they want whenever they please, by investing in public works in the same proportion, and if they want money henceforward it is entirely their own fault. I was speaking to Mr. Halliday about this book only two or three days before I left Bengal, and was surprised to find that he had not read it. I said to him, 'how is it that I, who am only a country gentleman and farmer, find it my interest to read this book, and that you, in such a responsible official position, do not think it worthy of notice?' Mr. Halliday said, 'Oh! Col. Cotton is too sanguine; when people talk of profits of 30 or 40 per cent., it makes one very suspicious of the soundness of their views.' 'What, 'said I,' is it the profits of 30 or 40 per cent. on public works which seem to you incredible, Mr. Halliday? why you have nothing to do but to refer to the Government records, or, as you are now going on a tour through your Government, to go to see scores of instances on the private properties of Zemindars, which I can refer you to, where the profits of banking, irrigation, road-making, &c., have been not 30 or 40, but 70 or 100 per cent., and you may see with your own eyes that the field for such investments is practically unlimited in India.'" Mr. Tagore then went on to inquire how it was that English capitalists were blind to these notorious facts? How it was that they invested millions upon millions sterling in every country except India, where they could get cent. per cent. for their investments for many years to come? How it was that when he saw the cost of Russian hemp jumping up at once £5 a ton, and when it had been proved, by trials at English dockyards, that we could grow much better and stronger hemp in India, that capitalists never attempted to develop the resources of that country? Mr. Tagore said a good deal more to the same effect, and he was very sorry that he was engaged and could not himself attend the meeting that evening; but he thought the testimony of such a very intelligent native of India to the value of Colonel Cotton's doctrines about public works in that country, was sufficiently important to warrant his addressing this assembly to repeat such a conversation, and he would leave Colonel Cotton to answer the scientific objections to his proposed improvements.

Mr. F. CARNAC BROWN said—Amongst all the speeches that had been delivered on this subject, no one had appeared as the representative of the natives of India. Now as he was connected with that country by property, he begged to say a word in their name. He would ask the meeting to realise to themselves the condition of that country, and, supposing the persons present were called upon to decide whether they would have some thousands of miles of communication of the nature on which the meeting was at present divided, at the same cost which they could pay for the more expensive means of communication by railways, which would they choose? He would ask them, supposing there were no turnpike-roads, and no canals in England, and it was put to them whether they would have turnpike-roads and canals, or whether they would have a high-speed railway; what would be their choice? For they must remember that India was, in its interior, utterly devoid of all communications. They had been told by Colonel Cotton, that it was impossible to transport the abundance of one county—he might go farther, and say, even of one hundred of a county—to assuage the famine which prevailed in another county; and there were parts of India where such a thing as a wheel conveyance was altogether unknown. With regard to what had fallen from Colonel Sykes, the deputy-chairman of the East India Company—and who had read

from papers which he could only have obtained in that capacity—

COLONEL SYKES.—They are all before Parliament.

MR. BROWN.—At all events he (Mr. Brown) could have no access to them. He had told them that he, with the other directors, had given a guarantee of interest upon £27,000,000.

COLONEL SYKES.—No, no. I said £17,000,000 was guaranteed for railways, and £20,700,000 was the total amount guaranteed and to be expended.

MR. BROWN went on to remark that a great parade had been made of the guarantee of 5 per cent. upon the property to be invested in Indian railways. The vast liberality of the East India Company in that respect had been proudly paraded before them; but he would put it to the meeting—supposing it was their money that was going to be dealt with in that way, would they not think they were entitled to have a voice in the matter? and again he would ask, if the question were submitted to them, whether they would have the description of railway which Colonel Cotton advised, (and recollect the gallant author had not spoken disparagingly of high-speed railways in countries where the necessities and exigencies of the case called for such,) or whether they would adopt a system of communication of which the great bulk of the Indian population, so impoverished, and, he regretted to add, so degraded as they were, could not avail themselves—what would be their choice? To ask the great bulk of the population of India to use a railway on these terms, was like asking them to use a coach and six; but they could use, and would use extensively, those tram roads which Colonel Cotton had advocated, for the reason that they were more economical, and would provide far more extensively for the wants and requirements of the country. He must beg of the meeting, in deciding this question, to put it to themselves what the choice of the natives would be in the matter,—the choice of those whose money was guaranteed to pay this 5 per cent. upon the expenditure for railways? With regard to the opening of the Godavery, Colonel Cotton had said nothing about the upper part of that river. All he had said was, that with its tributaries it was navigable 700 miles from the sea. But he (Mr. Brown) would ask, did not Palmer's house use that river, 30 years ago, as a communication to Hyderabad? This matter was not one to be decided by a 5 per cent. guarantee; and since the natives had not a voice in the disposal of their money, those who placed themselves in the position of disposing of it should bring before their eyes what the country required. He was sure that if the voice of the natives had any influence, they would decide for as cheap and extensive communications as could be made with their money.

MR. SIDNEY was not an Indian, but he had made the commercial resources of that country his study for many years, and he desired to recal the attention of the Society to the subject really under discussion, from which they had been led astray by all the speakers except the last. Railway officers and railway directors had occupied much time in proving that railways, executed and projected, were a sufficient substitute for every kind of road or public improvement, which was natural—and the deputy chairman had made a clever speech to show that the government of India was perfect—which was natural, too; all governors thought the same of their government. But it did not require Indian experience to judge of the value of the paper read by Colonel Cotton; when the facts were admitted, its value would be fully appreciated by any man of common sense and common commercial experience without the aid of Indian experience. That paper might be divided into two parts—an account of the resources of India, and of the best mode of developing them. No speaker had ventured to contradict Colonel Cotton's first positions, the foundation of all his conclusions. It was admitted that India was a country of admirably fertile soil, where, under

a tropical sun, with a sufficient supply of water, enormously increased supplies of produce could be grown, by the aid of 150 millions of half-naked, wretched, but industrious natives. That of this produce in cotton, sugar, rice, and tobacco, England was prepared, at a price, to consume an amount practically unlimited, and that the purchase money of such increased commerce would materially improve the condition of the native inhabitants, enable them to pay their taxes with ease, and to become customers for British manufactures. It was admitted, at any rate no one had ventured to deny it, that one great obstacle to increased cultivation lay in the absence of comprehensive irrigation works in situations where they could be established at a very trifling expenditure, and with a return at a high rate of interest, and still more in the want of means of conveyance either by railroad, or canal, or common roads. What the common roads of India were might be learned from the diagrams on the black board, copied from the *fac-simile* drawings of the late Mr. Mackay, the Manchester Cotton Commissioner. The Indian roads were tracks, marked out by cart-ruts, often as deep as the nave of the wretched carts, utterly impassable in the rainy season, and only available in summer at an absurd waste of power. Colonel Cotton was not content to point out the disease without suggesting the remedy, and his suggestions were backed by all the force of thirty years' experience in planning and executing the kind of works he recommended. He stated, and gave name, and date, and revenue returns, that proved that wherever the Indian government had expended capital in works of irrigation and of communication by land, by river, by canal, or by sea, not only had the rent-paying, tax-paying abilities of the natives been enormously increased, but a large percentage of profit had been reaped for the capital sunk. He (Mr. Sidney) had come prepared with a mass of evidence to the same effect, drawn from parliamentary documents of acknowledged authenticity; but it was unnecessary to detain the Society by accumulating proofs of the capabilities of India, wisely governed, and of the long years of neglect by the Indian government. It was no answer to Colonel Cotton's statements and conclusions, that one railway official should launch into a vivid description of railways planned and executed, and general laudation of the merits of a railway system; or that another should indulge in criticism, geographical and engineering, on points of detail, and which he was certainly less competent to decide than the author of the paper—the engineer of the Godavery Irrigation Works. It was no answer for the Deputy-Chairman of the East India Company to pit his fifty years' military experience against Colonel Cotton's thirty years' engineering experience, or for him to parade the expenditure on public works in a period of thirty years, which, large in millions, was small in comparison with the taxes paid by 150 million natives. It was no answer to the statement that Madras was without a port or a pier, to say that a Joint-Stock Company had tried to pass the Madras surf with a piled pier and failed. Had any eminent engineer been ever seriously consulted on the subject? But enough of these small cavils and detailed criticisms, which any minister in power could always find by the dozen, in order to discountenance, if he did not put down, an earnest practical reformer. The Society was not called upon to condemn Indian railways; far from it. He (Mr. Sidney) had no doubt that railroads, in more ways than one, would confer great benefits on our Indian empire, not the least by introducing a new class of scientific and practical men into that country. But the real question was whether a few hundred miles of railroads, executed and planned, were a sufficient substitute and atonement for the all but total absence of practicable roads through 30,000 miles of India. Whether a wise and liberal expenditure on public works, in deepening rivers, making cheap canals and cheap light railroads, would not amply repay the Indian government, both directly and indirectly. To these

questions the answers, as contained in Colonel Cotton's paper, were all one way. He (Mr. Sidney) earnestly called the attention of the Society to the condition of the Indian empire, over the future of which an enlightened public opinion in England, and England alone, had the power of exercising so beneficial an influence, for in India there was no public opinion. The government of Canada and Australia had virtually passed from our hands. They were colonized countries, and colonists soon learned to manage their own business without the drag-chain of Boards and Commissioners. But India was a conquered country, which could never be colonized, governed (until recently) by the traditions of conquerors, who, having found on entering into possession, an existing revenue, had never been pushed on to execute those works which had raised the colonists of the United States and Canada, in a less fertile soil, to their present flourishing condition. A parallel to the condition of India might be found near home—in Connaught, in Ireland, in the early part of the present century. There the landlords were the descendants of conquerors, and under the traditions of conquest, a rack rent, exacted from a miserable tenantry, pressed them down and detained them in the lowest state of degradation. There were no reproductive works, public or private; the fields were undrained and unfenced; the stock and the cultivator were alike without fitting shelter. The ragged tenant for his rent obtained leave to exist, and received, in times of famine, a remission of arrears of rent which it was impossible he could ever pay. A contrast was to be found in the English landlords, who spared the capital of their tenants by handing over their farms provided with the "works" necessary for production, and who met times of agricultural distress not by a mere abatement of rent, but by liberally investing money in drainage and improved farm buildings. The Irish landlord of the old sort (they were improved now) was a type of the traditional Indian government, which took all it could from the Indian cultivator beyond a bare existence, and remitted or expended in times of famine sums of money sufficient, if wisely expended on roads, ports, and irrigation, to make famine impossible. For his own part he (Mr. Sidney) hoped better things of the future Indian government, and would have been glad to have treated past shortcomings as "bygones," had it not been for the tone and scarcely candid criticism of the Deputy-Chairman. He felt assured that the Society of Arts could not more usefully employ its just influence than in supporting the broad, sound, economical principles laid down in Colonel Cotton's admirable paper—principles which would substitute for the sordid, short-sighted economy which had too long characterised the internal administration of India, a wise liberality in the rapid execution of reproductive works, which would cover the country with a net work of communication, working upwards from the cheapest to the most perfect, and place within the reach of the industrious population the means of fertility in water stored, and the inducement to labour in the shape of access to market; such works would render the collection of the Indian revenue an easy task, and in England, by the profits of increased commerce, the exchange of our manufactures for the produce of Indian agriculture, render the burdens imposed by war comparatively insignificant.

The CHAIRMAN then rose and said, the time had now arrived when it was necessary to begin to draw these proceedings to a close. He had therefore now to propose a vote of thanks to Colonel Cotton for his very valuable paper. Whatever differences of opinion had been expressed that evening, there was no one present who would not cordially join in doing honour to the gallant gentleman who had brought this important subject before them. But it might be expected of him to offer a few remarks on this occasion, and he did so with considerable diffidence, because he could pretend to no practical experience on the subject, and he moreover spoke in the presence of

gentlemen who were familiar with it both by experience and observation. He would offer one remark in reply to what had fallen from Colonel Sykes. That gentleman had attributed to Colonel Cotton the error of taking India for England, on principles applicable to England, but not applicable to India. He differed from his gallant friend upon this. He thought the only and sufficient defence of the paper was exactly the contrary, that, instead of the same principles being applicable, exactly opposite principles were applicable. In this country, if it were believed that a project would pay commercially, the money was readily found; if not, they waited until they thought it would. That was the way in which they dealt with things in England. But if that principle, which was the true principle of political economy, were applied to India, he very much feared it could not be carried out. It was simply because England was not India, because the same principles would not apply, because in India there is not the spirit of enterprise which exists in England, and they were obliged to begin at the wrong end, and look for the Government to make the country, instead of the country making itself. They were the landlords, as it were, of India; it was their estate, and the question was, whether they ought to be improving or neglectful landlords. India had been conquered at great expense, and at great loss of population, thereby occasioning a great discouragement to the industry of the country. They had acquired their possessions piece by piece, and they were conquered after a long period of civil commotion and brigandage. There were, therefore, allowances to be made for a government under such circumstances, and finding a country exhausted and depopulated, they did not plunge at once into the execution of very large public works; and, although he was by no means prepared to say that all had been done that might have been done, he said there was much allowance to be made in that respect, but he was prepared to say he considered the East India Company had by no means done its duty in the matter of public works. As the landlords of a great estate they had not done all that should have been done, and he did not think his gallant friend (Colonel Sykes) would say out of that room that £20,000,000, or one year's income, was a very great deal to have spent or projected to spend on public works in 30 years in a country like India. As far as the guarantee to the railways was concerned, he was not disposed to go into that question, because he thought the discussion upon that had been a little prejudiced by the desire on the one part to defend the course taken by the East India Company, and on the other part to defend the course taken by the advocates of railways in India; and although he was a member of the Government at the time this guarantee was proposed, for his own part he would not have given a shilling guarantee—not because he thought the guarantee was too high, but because a company under a guarantee was apt to lose a great deal of the stimulus to exertion, and was likely to be carried into an amount of extravagance and indolence that might not otherwise have occurred. With regard to irrigation, agreeing as he did with Colonel Cotton, as to the benefits of the system, even that, he thought, must be taken with some qualifications. They were not to lay it down as a rule that at every place they looked at it was worth their while as landlords to commence works of irrigation. The effect of the conquest had been, that the produce of the land had very considerably declined in value. It was not difficult to understand this. When the country was in a state of brigandage, that which escaped the hand of the spoiler fetched a higher price, whereas now the crop was used by those who grew it. The consequence was, the production was greater and the price was lowered. When there was a glut of produce it would be absurd to commence works of irrigation; that would only be to increase the producing power where the consuming power was wanted; and he therefore believed that the question of irrigation was to be taken not alone, but as subordinate to the

question of communication; for it was no use to increase the producing power of the country unless it could be carried to some profitable market. There was another element in the matter which was worthy of consideration, namely, our new conquests in Pegu, where it was said rice could be grown extraordinarily cheap and in vast quantities in the valley of the Irawaddy, and was said to be superior to the productions of Madras. But he was bound to say upon this point that the East India Company were doing all that could well be desired of them; because during the last year the Government of India sent out orders to spend as much money as was required for the public works, the only limit imposed being that the execution of those great works should not be put into unskilful hands, and that the expenditure should not take place until that had been secured. Another principle had been established, for the introduction of which they were indebted to Colonel Cotton, which was, that it was absurd to treat expenditure on public works in the same light as expenses that would never return anything—to consider the pay of a regiment the same as making a road or a dam,—and he repeated, for the establishment of that principle they were indebted to Colonel Cotton. With regard to communication in India, with all respect, he thought those railway gentlemen who had spoken against canals had taken too narrow a view of the case. He believed so vast were the resources of India, that plenty of employment could be found for any means of transport that could be suggested, and neither the railway directors nor the canal proprietors need look upon each other with jealousy. Railways were of great commercial use, but in a country like India, especially, they were of great political use. They had some 26,000 European troops in India, whose presence maintained the tranquillity of the country; and if, upon any emergency, it was necessary to summon those European troops to any particular quarter, they could, by means of the railways, be quickly called into action. An insurgent rajah might select the hot season for an outbreak, where they had but a small number of troops, and then they were obliged to concentrate their European forces at an amount of suffering and loss which could scarcely be conceived, and what our troops suffered in the Mooltan insurrection was scarcely to be told. It would tend to secure the permanency of our empire in India, if they had the means of conveying troops to any quarter of the country, without exacting from them those dreadful sacrifices, and would also invigorate the civil administration, by enabling the central power to investigate more closely the conduct of its officers in every department of the government. Colonel Cotton (continued the hon. chairman) was a man of whom this country, as well as India, had reason to be proud. He commenced, and he had carried out, the most gigantic plans of public improvements in India. It was to him we owed the noble work across the Coleroon, the Godavery, and the Kistnah; and it was to him also we owed what he believed to be the commencement of an entire revolution in the principles of Indian government. He had seen a document, signed by a member of the Council of Madras, which was not supposed to be particularly favourable to the mode of spending the public money of which Colonel Cotton had always been the consistent advocate, in which they said he had given them new views of their duties, and shown the duties of the Government in a light in which they had never seen them before—an admission honourable alike to the Government itself, and to the individual who extorted it from them. Colonel Cotton had begun a great work for India. He had turned the barren waste into a smiling garden, and carried the waters of fertility over the desert places, and he regarded him as a moral Columbus, who was opening out this vast country to our enterprise and energy, and giving that happiness to the people which they did not enjoy in the full measure which they ought under British rule.

The vote of thanks having been put from the chair, was passed by acclamation, when

Colonel Cotton said, in acknowledging the great honour of the vote of thanks, and the hearty way in which the chairman had proposed it, he could have wished to have replied to some things that had been said that evening, but at that late hour he must not detain them long. He would merely give one or two examples of the sort of answers he would offer. He must not even now forget the relative positions of the gallant colonel who had offered his remarks upon his (Colonel Cotton's) views, but still he must not hesitate distinctly to point out the real nature of his statements. The gallant colonel denied that the Upper Godavery was navigable. Now, he proposed to navigate the river from the Delta up to the centre of Berar, 450 feet above the level of the sea, in which part of its course it had a fall of a little more than 1 foot a mile. He met this, by telling the meeting the impracticability of the river near its sources, in the western ghauts, at a level of 1,500 feet above the sea, where it had a fall of many feet per mile. Now, what in the world had the impracticability of the river 1,000 feet above the level to which he proposed to navigate it, to do with what he spoke of. Again, the gallant colonel said he did not believe there was one Mahomedan work that we had allowed to go to ruin. He never used the word Mahomedan. He spoke of old native works; it was quite possible that not one Mahomedan work was in ruins, and that the works that had been neglected were the works of Hindoos. But it was notorious that there were hundreds, nay, thousands of native works now in every stage of decay. Numbers that were in a comparatively effective state when we took possession of them, and upon which the lands below them were wholly dependent for their value, were now in complete ruin, so that those lands were utterly valueless, and without a population. These two points would give an idea of the value of the words that were uttered, and dignified as answers to the statements he had made, and from these the meeting might judge how easily the rest that had been offered might be shown to be altogether unsubstantial, did time permit him to reply at length. He would also just refer to what a preceding speaker had said in reply to the gentleman (Mr. Nicholson) connected with the Bombay Railway. The former pointed out that the point from which he proposed to bring the Berar cotton to Bombay, a point 150 miles from that port, was not only not in Berar at all, but was actually 250 miles from the centre of the cotton tract in that district. He said he could convey it by rail from thence to Bombay for 13s. 4d., but he had to convey it 250 miles before he could put it on his railway at the point he mentioned. This was a specimen of a railway gentleman's attempts to set aside what he insisted upon, viz.:—that what India required was, that it should be pervaded by a system of communications for very cheap transit, in the shortest possible time, and that hence, with a navigable and improvable river now flowing from the cotton country 400 miles to the coast, it was a great mistake to spend £3,000,000 or £4,000,000 on a railway 400 miles long, with an ascent of 2,500 feet, and that would probably take 20 years to execute. He must just add, that a gentleman, a civil engineer, from the United States, who, from the great superabundance of speakers to-night, had not had an opportunity of stating it to the meeting, had mentioned to him, as a remarkable corroboration of one of his main positions, viz.:—that railways never could convey the main goods traffic of a country,—that it had been calculated that if the present traffic by the Erie Canal had to be transferred to the railway that runs parallel with it, it would require six lines of rails to be incessantly worked night and day to convey it; and, with respect to the comparative effects of speed and cost upon first-class passenger travelling, almost the whole of the passengers now go by the Hudson steamers from New York to Albany, 160 miles, in preference to the railway, on account of the less cost. He would not detain the meeting any longer than to again offer his sincere acknowledgments for the honour and compliments that had been paid him.

The Secretary announced that the Paper to be read at the meeting of Wednesday next, the 2nd of May, would be "On Juvenile Crime as it affects Commerce, and the best means of repressing it," by Mr. Jelinger Symons, B.A., one of her Majesty's Inspectors of Schools.

. It having been represented, after the meeting, that there were still many gentlemen who were anxious to make some remarks on the subject of "Public Works for India," the Secretary is authorised to state that an Extraordinary Meeting has been fixed for Monday the 7th of May, at eight p.m., for the purpose of renewing the discussion.

ARTISANS' VISIT TO PARIS.

In publishing the following prospectus, the Council makes the announcement for the information of parties interested, but is in no respect responsible for the carrying out the promises put forth.

The Council, however, has understood that some English workmen, at present in Paris, connected with the Exhibition, have availed themselves of the accommodation offered, and express themselves well satisfied.

PARIS EXHIBITION OF 1855.

ARTIZANS' RENDEZVOUS.

Offices.—Rue Drouot, No. 14, Paris.

With a view to facilitate the visit of the industrious classes to the Universal Exhibition, and to protect them from the exorbitant charges and impositions to which they would otherwise be liable, the Artisans' Rendezvous has made arrangements for providing board and lodging for *bona fide* members of those classes on the following

TERMS:

1st. Visitors will have to make their own arrangements in England for the journey to Paris. Information of the cheapest and best routes given at the London office.

2nd. The contract of the Paris office will only come into operation from the moment of the subscriber's arrival in Paris.

3rd. The subscribers will be lodged each in a separate room containing a single bed, with accommodation similar to that in the model lodging houses in London. They will be entitled to three meals a day, breakfast, lunch, and dinner or supper, *ad libitum*, liberally served, and comprising English and French fare, and also to the use of a common room, provided with English newspapers, maps, guides, and books of reference relating to Paris sights and amusements.

4th. Interpreter guides, in the proportion of one to each party of 25, will be placed at the disposal of subscribers, to accompany them to the Exhibition, conduct them to the sights of Paris, and make themselves generally useful to the subscribers.

5th. Subscribers in parties of not less than 25, if three days' notice be given to the London office, will be met, on their arrival at the railway station in Paris, by an agent of the Paris office, and will be at once conducted to their lodging.

6th. The charge for the above accommodation and advantages will be 5s. 6d. per day, including the registration fee, lodging, board, attendance and guides.—No gratuities will be allowed to servants.

7th. The above charge is exclusive of beer, wine, or spirits, which will have to be paid for apart as ordered; the price of beer being 3d. per bottle, and wine 7d. to 1s. per bottle.

8th. Intending visitors at the time of subscribing must fix the *minimum* number of days they propose to remain in Paris, and pay on account the registration fee of 6d. per day. The remainder of the subscription, at the rate of 5s. per day, is to be paid in advance, either at the London or Paris office, at the option of subscribers.

These regulations are indispensable, in order that accommodation may be prepared beforehand, and guaranteed to subscribers in succession.

9th. Any arrangement for extension of the visit beyond the number of days fixed at the time of subscribing must be made in Paris, and will depend upon the accommodation available. The subscriber must clearly understand that the Paris office is under no engagement to him beyond the number of days paid for in advance.

10th. Certificates will be issued by the London agent, on payment of the subscription, and be exchanged in Paris for the Artisans' Rendezvous ticket.

Subscribers may have their letters addressed, and apply for information generally, to the Rendezvous Office, No. 14, Rue Drouot, Paris.

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W. H. J. TRAICE 35, Park-row, Leeds.

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No. 14, RUE DROUOT, PARIS.

CALCULATING MACHINE.

A calculating machine has lately been brought from Sweden into this country, by the inventors, Monsieur Scheutz, a Swedish gentleman, and his son. The machine is of that class known to mathematicians as a difference engine, its calculations being made on the principle of differences. The machine is adapted for calculating tables the law of whose formation is dependent on the addition of successive differences. It not only calculates the series of numbers, but it impresses each result on a piece of lead, from which a cliché in type metal is taken, thus producing a stereotype-plate, from which printed copies may be obtained, free from any error of composing, &c. To explain the working of the engine, and the mechanical contrivances by which its objects are effected, would be impossible without a series of elaborate diagrams and a very lengthened description, though it may be stated that the mechanism is peculiarly simple. The machine *calculates* to sixteen figures, but *prints* to eight only; and by a singularly ingenious, and at the same simple, contrivance, the eighth figure in the table is printed, not in all cases as calculated, but with a correction, when required, for the ninth and subsequent figures omitted in the table. Thus, wherever the ninth figure as calculated amounts to five or more, it is more accurate that the eighth or final figure in the table should be printed with the addition of one; this the machine accomplishes. By taking out certain wheels and inserting others, the machine can be readily caused to produce its results in £ s. d., degrees, minutes, and seconds, or any other series of subdivisions which may be thought desirable. In the series of successive additions of which the machine consists, the contrivance by which the carriage on arrival at ten is effected displays much ingenuity. The machine performs its operations, when once set to the law on which the required table depends, by simply turning a handle, without any further attention, the power required for the purpose being extremely small, not more than a child of ten years old could supply. The calculations are made, and the results impressed on the

lead at the rate of about 250 figures every ten minutes, the machine being worked slowly. It may be worked much faster, but in that case there might be danger from the momentum a rapid motion would generate in the wheels. It is said that the inventor has spent all his means in perfecting the instrument. It is to be hoped that some plan may be adopted by which the valuable powers of the machine may be rendered practically available for supplying the public with a perfect set of logarithmic and other tables, a desideratum long sought, and at the same time remunerate the inventor for his ingenuity and talent.

Home Correspondence.

THE DECIMAL SYSTEM OF COINAGE.

SIR,—I regretted not to be able to attend the late discussion of the Society on the subject of "Decimalising our Money Scale," and must trust to your kindness in allowing me to make a few observations in your Journal in support of those views of the subject that have obtained the appellation of the *pound and mil* scheme. I have seen no reason for changing my opinion of the extreme impolicy of interfering, in the way proposed by the advocates of the *penny and franc* plan, with the real poor man's unit, the *shilling*,—the measure of value in, perhaps, ninety-nine transactions in every hundred, of the tradesman; the proposed substitute for which, by a tenpenny coin, would involve us in making practical difficulties, without realising a perfect scheme of decimal accounting. In fact, according to some of its projectors, this would only be applicable in small affairs, whilst in large ones, in which the pound would be used, the decimal scale must of necessity be abandoned for some clumsy makeshift. The objection to change, so far as I have observed, in the public mind, is chiefly based on the groundless supposition of the necessity of an alarming influx of new money, to be accompanied by new ideas and standards of value. I have met these arguments by shewing that no novelties at all are required; that the present coins admit of perfect adaptation to decimal arithmetic, weeded of a few that may desirably be dispensed with. The following scale of circulating money will conveniently exhibit my views:—

Sovereign	1000 mils.	} Gold.
Half-sovereign	500 "	
Florin	100 "	} Silver.
Half-do., old shilling	50 "	
Quarter-do., old sixpence	25 "	
Eighth-do., old threepence	12½ "	
Four mil, old penny	4 "	} Copper.
Two mil, old half	2 "	
One mil, old farthing	1 "	

A question may remain as to the eighth of a florin, dividing as it does the mil, which in practice, I believe, would be unimportant; or if otherwise, we can well enough do without it, or any substitute. My scale proposes that the money of the old and new systems are to be identical, coin for coin, stamping excepted; and that no future money, either silver or copper, shall be issued unless stamped respectively, in conformity with prospective decimal arithmetic, in mils. I propose no present attempt at using them in any way but as heretofore, side by side with the old ones. The representatives of the existing copper money would be introduced bearing the marks 1, 2, and 4 mils, no notice of the new stamping being taken at the time of issue. Beyond this, nothing in size would mark any difference from those now passing current, of which they would form a part, circulating as farthings, halfpence, and pence. No innovation, partial or otherwise, is to take place in our mode of accounting; whilst in the mean time the ultimate period of transition would depend on the operations at the Mint, the changing process doubtless being

spread over several years. Time in such a case is unimportant compared with certainty of success, and avoiding our intermediate state of perplexity between two conflicting systems. The old scale would continue in operation, whilst the masses would be learning their lessons from the new coins, and their relative value under the forthcoming scale, till the period should arrive when the final step might safely be taken of declaring by proclamation the future relations of one coin to another. This should be delayed till there was a preponderance of new over the old coinage, perhaps a considerable one, followed up by the introduction of decimal arithmetic at the public offices, in correspondence with the three denominations of coins—*pounds, florins, and mils*. It is not pretended that a vast process like this can be accomplished without some possible difficulties, unapparent to non-official eyes; but I think the mode of procedure thus contemplated would reduce them to their minimum: at all events they are not insurmountable, and the required extra effort would be a final one. The copper money alone appears to present room for controversy at its altered value under the new system. Probably the holders of this in large quantities are not very numerous, but ascertained loss up to a certain point ought to be met at the Treasury for a stated period, afterwards the dates upon the pieces would be distinctive. The imagined dissatisfaction, of which so much has been foretold as likely to arise amongst the lower classes, at any change in the copper, I put down at nothing, believing that the amount of oppression falling in that quarter would be limited to the extra labour of counting 25 instead of 24, in change for a sixpence. The Chancellor of the Exchequer requires no assistance of mine; he will probably be wise enough to sit down quietly under a slightly diminished revenue. The claims for compensation in matters of diminished penny tolls, &c., might be anticipated at once, by a ten years' notice to such proprietors of the coming event; these must be satisfied with the grand arbitrator of all things—*Time*. Something approaching to alarm has been manifested at the mention of 20 years, as required to finally extinguish the present system of money. We have already talked out nearly 8 years, since Sir John Bowring's motion in Parliament, so luckily successful, for introducing the first step in decimalisation,—the tenth of a pound. Lord John Russell informs us that thirty years is about the average period required by John Bull to meditate over an improvement. The French were twice as long before they took a final leave of their old coins. Suppose, immediately on the passing of the Reform Act, we had commenced the process of changing our system, and had just now properly and finally completed it, the interval would not have appeared either very long or ill spent. Moreover, in estimating the relative advantages of the two modes of decimalising our money now dividing attention, mere time ought to weigh as dust in the balance, in comparison with considerations infinitely more important.

In my view it is a matter of indifference in what order the proposed change of money should come, or whether new silver or copper coins be issued in succession or simultaneously. This is a matter of Mint convenience, and of Birmingham contract arrangement. Erroneous ideas are afloat, and ought to be refuted, that the decimal system of accounting requires decimal modes of thinking and valuing, in *tenths*, or parts of tenths. This is a mere fallacy. The natural habits in all countries in common dealings induce the practice of continual *halving and quartering*, and nothing would more disgust the public than an interference with a *binary* division of the current coins as now existing. John Q. Adams took some pains in convincing the Americans that decimal book-keeping involved no necessity for using inconvenient or unusual money; that the questions were distinct, and that the coins ought, as far as possible, to be divisible binarily, to give facilities for ready counting—a point usually much lost sight of. Every banker knows this, and the remark made by one to me was, that no silver coin was admissible that was not

some aliquot part of a hundred mills. In consequence I omitted in my scale a 15-mil piece, which, I observe, forms a part in the one laid down by your correspondent Mr. Tripp. Neither would the *fifth* of a florin meet any requirement of the public. The Select Committee having, as I consider, made one false step, by recommending the introduction of a 10-mil piece (at once too small and too large for utility), naturally follow it up with its *half* and *double*; still, from necessity, retaining the indispensable quarter-florin; so that the public and cashiers would be plagued with these two coins, side by side, and almost undistinguishable. I may make an observation respecting the penny copper coin in its present form, as first introduced in the reign of George the Third. I confess I never had the same satisfied feeling respecting its value as a poor man's unit that many profess to entertain; although, as a matter of expediency, I have retained its representation in my scale. I rather agree with those who believe that it is too often employed in a way contrary to the interests of any class; that it is the daily medium of our change in small things, not intrinsically worth probably more than three farthings—the price too commonly being dependant on the *coin*, not the coin on the *price*. It may be imagined that, holding this opinion, I should not acquiesce in the introduction of a coin—a *five-mil piece*—exhibiting all the evils appertaining to the penny, with aggravation. Both coins could not co-exist, and employed as a substitute, one for the other, it would be discovered that, used singly, we got no increase of value for it. I am convinced that he is the best friend to the poor man who would give him the means to acquire a habit of reckoning with the smallest money. In a correspondence with Sir John Bowring on this and some other points, especially as regards any addition to our coins, I think our views became nearly identical. He thus expresses himself, in a communication to me, bearing date 5th October, 1853:—"In copper I would have only the 1 and 2 mil; 2 *gold*, 3 *silver*, and 2 *copper*, are the only coins I would retain."

HENRY TAYLOR.

London, 26th March, 1855.

To Correspondents.

ERRATA.—In Mr. Good's letter on Decimal Coinage, in the last number, third paragraph, for "coin piece," read "4 coin piece." In postscript, last line but one, for "This expression," read "This arrangement."

MEETINGS FOR THE ENSUING WEEK.

- MON.** Zoological, 1 p.m. Anniversary.
Actuaries, 7.
- TUES.** Horticultural, 1 p.m. Anniversary.
Royal Inst., 2 p.m. Annual Meeting.
Civil Engineers, 8. Discussion on Mr. Barton's paper "On the Economic Distribution of Material in the sides or vertical portion of Wrought Iron Beams."
Linnean, 8.
Pathological, 8.
Royal Inst. 3. Dr. Tyndall, "On Voltaic Electricity."
- WED.** Society of Arts, 8. Mr. Jellinger Symons, "On Juvenile Crime as it affects Commerce, and the best means of Repressing it."
Geological, 8. 1. Mr. E. Hull, "On the Physical Geography and the Pleistocene Phenomena of the Cotswold Hills." 2. "Notice of the occurrence of coal in the Gulf of Nicomedia." 3. Mr. R. Hurkness, "On the Anthracite Schists of the Lower Silurians in the South of Scotland."
- THURS.** Royal Inst. 3. Mr. G. Scharf, jun., "On Christian Art."
Antiquaries, 8.
Photographic, 8.
Royal, 8½.
- FRI.** Botanical, 8.
Royal Inst., 8½. Dr. Gladstone, "On Gunpowder and its Substitutes."
- SAT.** Asiatic, 2.
Royal Inst., 3. Dr. Du Bois Reymond, "On Electro-Physiology."
Royal Botanic, 3½.
Medical, 8.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Delivered on 19th and 20th April, 1855.

- Par. No.
110. Local Acts (24. Newton and Oswestry Railway; 25. Folkestone Improvement; 26. Ayr Harbour; 27. Glasgow Corporation Waterworks)—Reports from the Admiralty.
150. Railway and Canal Bills Committee—3rd Report.
170. Committee of Selection—9th Report.
77. Bills—Testamentary Jurisdiction.
74. Bills—Edinburgh Lands.
81. Bills—Education of Pauper Children.
Transport of Stores, &c., to the East—Diagrams.
Prisons—19th Report of the Inspectors (Southern and Western District), Part 3.
Post Office—1st Report of the Postmaster-General.
Convict Discipline and Transportation (Australian Colonies)—Further Correspondence.
Delivered on 21st and 23rd April, 1855.
166. Public Income and Expenditure (Balance Sheet)—Account.
168. Deficiency Bills, &c.—Return.
173. Bullion, &c.—Account.
174. Land Force, &c. (India)—Abstract Return.
180. Probate, &c., Duty—Return.
181. Arctic Expeditions—Return.
182. Bank of England—Copy of Letter.
185. Supply, Expenditure, &c.—Return.
157. Civil Contingencies—Account and Estimate.
164. Governors of Colonies—Return.
169. Harbours of Refuge—Return.
184. British Museum—Accounts, Estimates, &c.
75. Bills—Passengers Act Amendment (amended).
82. Bills—Despatch of Business, Court of Chancery.
78. Bills—Poor Law (Scotland).
79. Bills—Sunday Trading (Metropolis).
80. Land and Assessed Taxes—Divisions.
National Vaccine Board—Report.

SESSION 1854.

493. Settlement and Removal—Supplement to Mr. Coode's Report.
Delivered on 24th of April, 1855.
178. Spirits, &c.—Return.
179. Spirits (Scotland)—Return.
187. Post-office Department (Packet Service)—Estimate.
83. Bill—Intestacy (Scotland) (amended).

PATENT LAW AMENDMENT ACT, 1852.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[From Gazette, April 20th, 1855.]

- Dated 29th March, 1855.*
704. W. James, Crosby-hall Chambers—Screw bolts.
Dated 30th March, 1855.
710. G. H. and A. M. Babcock, Westerly, Rhode Island—Polychromatic printing presses.
Dated 4th April, 1855.
754. R. Hills and H. Monument, Caroline-place, City-road, and T. Miles, Queen-street, Finsbury—Corking bottles, jars, &c.
Dated 5th April, 1855.
736. T. Squire, Latchford—Removing hairs from hides and skins. (A communication.)
758. J. Carlhian, Paris, and F. J. Corbière, 27, Castle-street, Holborn—Soda water and aerated liquids. (A communication.)
760. J. Brazier, Wolverhampton—Revolving fire-arms.
762. D. Lane, Cork—Motive power by water.
764. A. Longbottom, Leeds—Preparing sand for casting. (A communication.)
766. P. Arrive, 7, Spencer-street, Gravesend—Safety valves.
Dated 7th April, 1855.
768. R. W. Waithman, Bentham-house, York—Lint.
770. A. Rollason, Birmingham—Photography.
772. R. Stones, Kingston-upon-Hull—Taps.
774. J. Aresti, Greek-street, Soho—Drawings on stone.
776. D. G. Jones, M.D., 14, Harrington-square—Farinaceous food.
Dated 9th April, 1855.
778. J. C. Kay, Bury—Pressure and vacuum gauges.
780. Lieut. E. O'Callaghan—Ordnance and projectiles.
782. W. Bull, Ramsey, Essex—Instrument for cutting vegetables.
Dated 10th April, 1855.
784. W. Ricketts and T. Bulley, Stepney—Table covers.
786. P. A. le Comte de Fontaine Moreau, 4, South-street, Finsbury—Steam boilers. (A communication.)
788. J. H. Johnson, 47, Lincoln's-inn-fields—Combing wool. (A communication.)
790. L. Monzani, St. James's-terrace, Bermondsey—Folding stools and chairs.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

800. E. Pasquier, Reims, France—Machine for drying wool.—11th April, 1855.
806. S. Hjorth, Copenhagen—Magneto-electric battery.—11th April, 1855.

807. S. Hjorth, Copenhagen—Electro-magnetic machine.—11th April, 1855.
808. S. Hjorth, Copenhagen—Electro-magnetic machine.—11th April, 1855.

WEEKLY LIST OF PATENTS SEALED.

Sealed April 18th, 1855.

2229. George Hamilton, 86, Great Tower-street—Improvements in obtaining soundings.
2233. Howard Ashton Holden, Birmingham—Improvements in roof lamps for railway or other carriages, and for parts used in connection with the same.
2235. Benjamin Nicoll, 42, Regent-circus, Piccadilly—Improvements in shirt-fronts.

Sealed April 20th, 1855.

2251. William Green, Howard-buildings, Brick-lane, St. Luke's, and Joseph Pickett, Duke-street, City—Improvements in treating or ornamenting textile materials or fabrics and paper, and in machinery or apparatus for effecting the same.
2252. Edward Abell, Lambeth—Improved instrument to assist the hand in writing.
2254. George Savage, Adderbury, Oxford—Improved singeing lamp.
2255. Abraham Gerard Brade, Paris—Improvements in the manufacture of plate and thread for gold and silver lace and bullion.
2266. Joseph Hopkinson, jun., Huddersfield—Improvements in steam-engine boilers and safety valves, and in apparatus for indicating the vacuum in steam-engine condensers in relation to the existing atmospheric pressure.
2278. Louis Vital Hellin, 8, Rue des Douze Apotres, Brussels—Improvements in the manufacture of paper from straw.
2280. William Grindley Craig, Gorton, near Manchester—Improvements in the mode or method of consuming smoke, and in the machinery or apparatus employed therein.
2282. John Healey, John Foster, and John Lowe, Bolton-le-Moors—Improvements in machinery to be used for drawing, moulding, forming, and forging articles in metal.
2346. William Childs, jun., Brighton—Improvement in the manufacture of pipes and tubes.
2364. James Whitehead, Patricroft—Improvements in self-acting mules.
2394. Eugene Rimmel, 39, Gerrard-street, Soho—Improvements in combining matters to be employed in coating fabrics and leather, and for other uses in substitution of India rubber. (A communication.)
2414. George Bodley, Everhard-street East—Improvements in revolving cannon.
2536. Dominique Bazaine, Paris—Improved system of railway, applicable especially on common roads.
116. Jean Antoine François Victor Oudin, Mons, France—A new liquid for preventing sea sickness.
318. Alexander Sands, Liverpool—Improved fastening or detainer to be employed as a substitute for "clothes-pegs," or for other similar purposes.
340. William Blythe, Oswaldtwistle, and Emile Kopp, Accrington—Improvements in the manufacture of soda ash and sulphuric acid.
356. Andrew Henshaw Ward, jun., Massachusetts, U.S.—Improved loom temple. (A communication.)
388. George Noble, Sunderland—Improvements in the manufacture of fire bricks.
410. John Henry Johnson, 47, 'Lincoln's inn-fields—Improvements in fountain pens. (A communication.)

Sealed April 24th, 1855.

2142. Thomas Harris, Nanty Glo, Aberystwith—Separating the steam from the condensed water and mud in its transit from the boiler to the cylinder of a steam engine, stationary or locomotive.
2273. William Thomas Smith, New Hampstead-road, Kentish-town, and George Hill, of the City-road—Improvements in machinery or apparatus for winnowing, washing, sifting, or separating corn, gravel, minerals, and other materials.
2283. Joseph Eccles, Blackburn—Improvements in machinery for the manufacture of bricks.
2287. James Griffiths, Wolverhampton—Improvements in the mode or process of manufacturing certain kinds of iron, and in the machinery or apparatus used in such manufacture, part of which improvements are also applicable to machinery used in the manufacture of other descriptions of iron.
2289. Auguste Edouard Loradoux Bellford, 16, Castle-street, Holborn—Improved mode of operating trip hammers.
2291. Astley Paston Price, Margate—Improvements in the calcination and oxidation of certain metallic, mineral, and metallurgical compounds, and in the apparatus and means for effecting the same.
2292. William Ashton, Preston—Improvements in safety or escape valves.
2297. Edward Lindner, New York—Improvements in revolving breech fire-arms and magazine.

2298. Jean Pierre Savouré, 2, Catherine-street, Strand—An improved gold coin detector, applicable also for weighing postal communications.
2319. George Taylor, Holbeck, near Leeds—Improvements in mills for grinding corn and other substances.
2320. James and William Bradshaw, Blackburn—Improvements in time-pieces.
2334. Edouard Alexandre, Paris—Improvements in organ-pianos.
2353. Andrew Peddie How, Mark-lane—Improved machine for cutting metal rods and bars. (A communication.)
2360. John Blaikie, Glasgow—Improvements in the manufacture of driving belts, straps, and bands for machinery.
2381. David Tunks, Accrington—Improvements in watches, clocks, chronometers, time-pieces, and all other instruments for the measurement of time.
2385. James Niven, Keir, near Dunblane, Perthshire—The application of a new material to the manufacture of paper, and also of textile fabrics.
2396. William Kloen, Birmingham—Improved method of ornamenting and attaching labels, cards, window, and other bills.
2400. The Honourable William Edward Fitzmaurice, Hamilton-lodge, Kensington-gore—Improvements in bullets, shells, and other projectiles.
2426. Robert Wilson, Birmingham—Improved ornamental material or fabric.
2479. Henry Jules Duvisier and Henri Chaudet, 20, Rue de la Glacière, Paris—Improvements in treating gutta serena.
2541. Peter Armand le Comte de Fontaine Moreau, 4, South-street, Finsbury, London—Improvements in the manufacture of palm-leaf hats and carcasses for hats. (A communication.)
2544. Henry Strong, Ramsgate—Improvements in the prevention of back smoke in chimneys.
2737. Peter Haworth, Manchester—Improved belt, band, or strap fastener.
2747. Ashton Stansfield and Josiah Greenwood, Todmorden—Improvements in power looms for weaving.
22. John Venables and Arthur Mann, Burslem—Improvements in producing raised figures or ornaments upon the surfaces of articles made of metal pottery and earthenware, glass, papier maché, and other materials.
23. John Venables and Arthur Mann, Burslem—Improvements in producing figures or ornaments in articles made of clay or plastic material.
61. Thomas Wilson, Birmingham—Improvements in the manufacture of bands used in the construction of small arms.
199. George Bell, 21, Cannon-street West, City—Improvements in constructing air springs.
233. John Smith and James Hollingworth, Langley Mills, Brancepeth—Improvements in treating certain fibrous materials for manufacturing paper.
243. William Taylor, 16, Oxford-terrace, Hyde-park—Improvements in cables for holding at anchor and towing ships and other floating bodies.
247. Alexander William Williamson, University College, Gower-street—Improvements in apparatus for feeding fires.
319. Louis Adolphe Ferdinand Besnard, Paris—Improved composition for fixing lithographs and engravings on canvass after being transposed or reproduced by a printing press.
337. James Nichol, Edinburgh—Improvements in bookbinding.
339. Francis Brown Blanchard, Maine, U.S.—A new and useful apparatus for generating motive power from heated air, steam, and the products of the combustion of coal or other fuel.
347. William Spence, 50, Chancery-lane—Improvements in substitutes for glass for ornamental purposes. (A communication.)
353. Fortunato Gaetano Pietro Maria Vittorio Maneglia, Turin and Genoa Railway—Improvements in railway carriages.
380. Thomas Organ and George Pitt, Birmingham—Improved dress fastening.
389. Paul Prince, Derby—Improvements in the patterns employed in making moulds for railway chairs.
397. Frederick William East, 214, Bermondsey-street, Southwark, and John Mills, William-street, Neat-street, Old Kent-road—Improvements in destroying the noxious vapours arising from boiling oil, bones, and other matters in the open air.
413. John Scott Russell, Mill-wall—Improvement in the construction of ships or vessels to facilitate the use of water as ballast.
421. Charles Henry Roberts, 3, Cornwall-road, Stamford-street, Lambeth—Improvement in the manufacture of rubbers for painters and others.
458. James Lewis, Abergavenny—Improvements in stench-traps.
467. Alfred Vincent Newton, 66, Chancery-lane—Improvements in the construction of printing presses.
479. Timothy Walker Carter, Massachusetts, U.S.—Improvements in repeating fire-arms. (A communication.)
501. Eugene Tardif, Bruxelles—Improved construction of numbering apparatus.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
3709	April.	Portable Camp Arm Chair	Edmund Brown Bishop Wren	232, Tottenham Court Road.